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ABSTRACT

This updated curriculum guide is designed to provide teachers of elementary school science with a set of activities on recycling and waste reduction. The curriculum has three sections: (1) Grades K-3 Lessons; (2) Grades 4-5 Lessons; and (3) Teacher's Resource Guide. It is designed to take students from an introduction to natural resources and their uses to what happens to something when people are finished with it to ways to conserve, prevent, compost, and recycle. Lessons are grouped into subject areas such as Environmental Awareness, Solid Waste, Waste Prevention and Reuse, Recycling, and Composting. Teachers are able to pick and choose the lessons according to their class needs, as long as the students are given background from other lessons (prerequisite information is indicated) and appropriate vocabulary words. (MM)

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SOLID WASTE PROGRAM

RETHINKING RECYCLING:

An Oregon Waste Reduction Curriculum

State of Oregon
Department of Environmental Quality

ED 466 402

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Oregon

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June 2001

FOREWORD

William Butler Yeats once said, "Education is not the filling of a pail, but the burning of a fire." No one understands this concept better than our teachers. With the release of the updated Rethinking Recycling: An Oregon Waste Reduction Curriculum (K-5), our goal is to provide a balanced look at solid waste issues in Oregon to allow students to investigate, interpret, analyze and set their problem solving skills "on fire." It is important for students to realize that current paradigms may not always be future solutions.

The mission of the Oregon Department of Environmental Quality is "To be an active leader in restoring, enhancing, and maintaining Oregon's air, land, and water." By providing educational support materials to our teachers, we hope that students will be active in shaping Oregon's future and become stewards of our air, land and water. Rethinking Recycling now includes relevant Common Curriculum Goals and Benchmarks with each lesson to make it easier to integrate into existing curriculum plans. A Teacher Resource section provides additional information and other resources for environmental lessons.

Rethinking Recycling was updated using a teacher as a consultant and reviewed by other teachers and public agency educators. I hope you find this information useful and relevant in your classroom discussions on environmental awareness, resource conservation, and waste reduction.

Sincerely,

Stephanie Hallock

Stephanie Hallock
Director

STAN BUNN
State Superintendent
of Public Instruction

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May 29, 2001

Dear Educator:

The Oregon Department of Education is pleased to participate in the distribution of *Rethinking Recycling…an Oregon Waste Reduction Curriculum*. This curriculum represents an opportunity for you to help students learn how they can make a difference in Oregon's environment. It provides excellent activities to teach problem solving and to help students examine the real-world issues they will face as citizens in the future.

Rethinking Recycling can be a valuable resource in achieving the goals of Oregon's school reform program. As individual students become aware of the impact their decisions have on our environment and take personal actions to reduce waste and protect our environmental quality, they will be demonstrating many of the applications of Oregon's Common Curriuculum Goals and Content Standards.

I encourage you to use these materials and to spread the word to your colleagues and community members about the importance of *Rethinking Recycling*. Keep up your good work as an Oregon educator for the 21st century!

Sincerely,

Stan Bunn

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REFERENCE MATERIALS

There are many excellent Waste Management curriculums available around the U.S. A condensed list of some of the best examples is provided in the Teacher Resource section. Special thanks are provided to the following agencies who generously provided materials that are included in this update of Rethinking Recycling.

Association of Vermont Recyclers:
Teacher's Resource Guide for Solid Waste and Recycling Education (1999)

California Integrated Waste Management Board:
Closing the Loop: Exploring Integrated Waste Management and Resource Conservation K-6 (2000)

Minnesota Office of Environmental Assistance:
What a Waste K-6 Waste Management Education Curriculum

South Carolina Department of Health and Environmental Control:
Action for a Cleaner Tomorrow (1996)

Also of special note, are the original contributing agencies whose borrowed materials still appear in some parts of Rethinking Recycling. Because the previous version did not credit the source on the content pages, we cannot always distinguish between original DEQ materials and the borrowed materials from agencies listed here.

Alameda County Office of Education, *California State Environmental Education Guide* (1988)
Association of Vermont Recyclers, *Teacher's Resource Guide* (1989), and *Teaching Toxics* (1992)
California Department of Health Services Toxic Substances Control Program,
The No Waste Anthology (1991)
Environmental Protection Agency, *Let's Reduce and Recycle:*
Curriculum for Solid Waste Awareness (1990 Revision)
Mary K. King, *Earth Aid First Aid* (1992)
Kraft General Foods Environmental Institute, *Solid Thinking About Solid Waste* (1992)
North American Association for Environmental Education, Educational Issues Forums
The Solid Waste Mess: What Should We Do With the Garbage (1992)
The San Francisco Recycling Program, *The 4th R Recycling Curriculum* (1988)
Washington Department of Ecology, *A-Way With Waste* (1990)

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The Curriculum

The DEQ's Waste Prevention and Management Division, Solid Waste Policy and Program Development section originally produced Rethinking Recycling (RR) in 1987. Rethinking Recycling was updated in 1994 in response to the Oregon Recycling Act, which set a statewide recovery goal of 50% by the year 2000. Over 300 teachers, environmental educators, public agencies, and businesses contributed to the production and field testing of RR. Additionally, all of the borrowed materials come from field tested, peer reviewed, award winning curriculums across the U.S.

To date, the highest recovery rate achieved by Oregon is 37%. During the 2001 legislative session, HB3744 passed and sets new recovery goals. Oregon's new goals are to reach 45% recovery by 2005 and 50% by 2009. Additional goals are to keep per capita waste generation and total waste generation from increasing by 2005 and 2009, respectively. To help meet these goals, this update of Rethinking Recycling includes current Oregon facts and statistics; has a greater emphasis on personal contributions to preventing and reducing waste; and is paired to the appropriate Oregon Content Standards and Benchmarks (in boxes at the end of each lesson). DEQ hopes that this new format and updated information will make RR easier to implement in the classroom so that more students will become part of the solid waste management solution.

The curriculum has three sections: K-3 Lessons and 4-5 Lessons, as well as a Teacher Resource section. Twenty lessons are provided for K-3 and 21 are provided for 4-5. Designed to take students from an introduction to natural resources and their uses; to what happens to something when we are finished with it; to ways to conserve, prevent, compost, and recycle, lessons are grouped into the following subject areas: Environmental Awareness, Solid Waste, Waste Reduction & Reuse, Recycling & Composting. They build on these concepts as you teach lessons 1-21. However, teachers will be able to pick and choose the lessons according to their class needs, as long as the students are given background from other lessons (prerequisite information is indicated) and appropriate vocabulary words.

Student environmental artwork from Khabarovsk, Russia - Portland's sister city.

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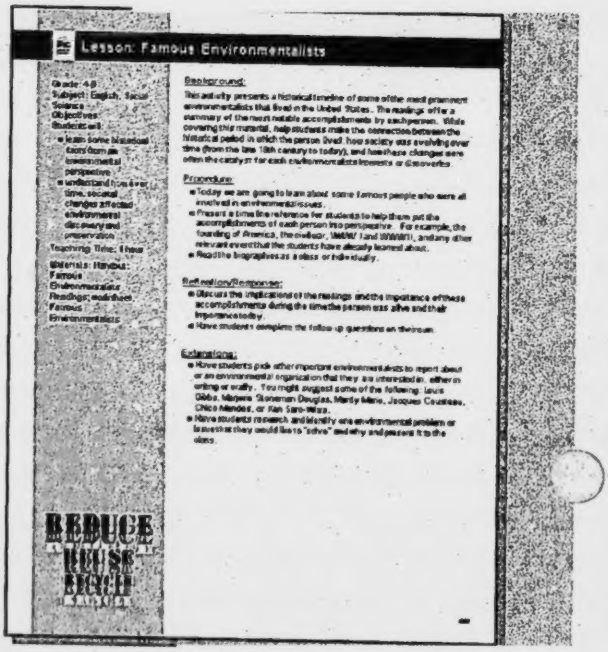
The Lesson Plans

Each Lesson Plan set provides the following:

left-hand bar:

- **Grade level:** K-3 or 4-5. (Note: K-3 follows Oregon content standards. However, some lesson concepts or activities may be difficult for K-1, adaptation is encouraged).
- **Subject:** how the lesson relates to the content standards.
- **Objective:** what students will learn from the lesson.
- **Approximate teaching time**
- **Materials:** a list of items needed to complete the lesson and suggested optional items.
- **Vocabulary:** special words are noted for some lessons.



Lesson: Famous Environmentalists

Background:

Procedure:

Reflection/Response:

Extensions:

The main section:

- **Background:** To provide an overview of the issue to the teacher.
- **Procedure:** explains execution and pre-activity discussion with students to determine what they already know.
- **Reflection/Response:** explains how students apply the information they have just been given and assigns assessment activities.
- **Extension:** explains what other related activities teachers might assign to go deeper into the lesson.
- **Oregon Content Standards Box:** current standards through 2002/2003 for Science and Social Science - new adopted Science and Social Science language matched to lessons is listed in this section. New Math and English content standards will be adopted in 2002 and matched to lessons on the DEQ web site version of RR.

About Us

The Oregon Department of Environmental Quality (DEQ) is a state regulatory agency whose job is to protect the quality of Oregon's Environment. DEQ is responsible for protecting and enhancing Oregon's water and air quality, for cleaning up spills and releases of hazardous materials, and for managing the proper disposal of hazardous and solid wastes.

Mission

To be an active leader in restoring, enhancing and maintaining the quality of Oregon's air, water and land.

DEQ staff uses a combination of technical assistance, inspections and permitting to help public and private facilities and citizens understand and comply with state and federal environmental regulations. DEQ regional offices are located in The Dalles, Bend, Salem, Portland, Eugene, Medford, Pendleton, Baker City, Klamath Falls, Ontario, Coos Bay, La Grande, Grants Pass, and Roseburg.

Oregon's history of environmental regulation dates back to 1938, when the Oregon State Sanitary Authority was formed. As a division within the State Board of Health, the Authority was formed in response to outraged citizens who overwhelmingly supported an initiative petition known as the "Water Purification and Prevention of Pollution Bill". The bill declared a state policy to preserve Oregon waters from pollution. In 1969, the Authority changed its name to the Department of Environmental Quality and established itself as an independent state agency.

Feedback & Additional Copies

Please help us make this curriculum as good as it can be. A user evaluation form is being mailed at the same time as Rethinking Recycling. As you use this curriculum please give us input on how well it worked in your classroom, suggestions for strengthening concepts, activities or worksheets, and ideas for lessons that we might add in the future.

Rethinking Recycling lessons and evaluation forms will be available on the DEQ web site at:
http://www.deq.state.or.us/wmc/solwaste/rethinkrecyc/rethinkrecyc.html
Your evaluations will allow active revisions to be made to the active web document--so please send us your thoughts!

Mail or fax your evaluation form to:
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Oregon Department of Environmental Quality
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Fax: 503-229-6977

To receive additional copies of Rethinking Recycling, contact the Solid Waste Education Coordinator at: 800-452-4011 or 503-229-5913
e-mail: solwaste@deq.state.or.us

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Lesson Objectives

Grades K-3

ENVIRONMENTAL AWARENESS

Lesson: Our Natural Resources

Students will:
- differentiate between natural resources and man-made items
- describe how families use natural resources

Lesson: Cycles in Nature

Students will:
- recognize cycles in nature
- evaluate the usefulness of natural cycles

Lesson: Litter Hunt

Students will:
- define what litter is
- describe some effects of litter on the environment
- describe ways that students generate and prevent litter

Lesson: Native American Culture

Students will:
- learn about Native American culture and their views and relationships with the environment
- understand that people from various backgrounds and parts of the world can think differently about the world around them

SOLID WASTE

Lesson: What Is Trash?

Students will:
- define garbage (waste, trash)
- reevaluate waste as a more productive resources

Lesson: A Lot of Garbage

Students will:
- define and give examples of waste
- identify the amounts of solid waste produced by individuals and groups

Lesson: Where Is Away?

Students will:
- recognize that there is no "away" in "throw it away"
- identify the destination of the waste they generate at home and at school
- identify the negative aspects of dumping or burning trash
- learn the "solid waste hierarchy" for best management of our trash

Lesson: Look At A Landfill

Students will:
- identify landfills as the most common method of disposing of solid waste
- describe the form and function of a sanitary landfill by observing a model
- understand that waste does not "go away" or decompose when it us in a landfill in comparison to a natural cycle
- discuss how landfills take up space and are located in areas that are, or were, habitats for people and wildlife

WASTE PREVENTION & REUSE

Lesson: Wants and Needs

Students will:
- discriminate between want and needs, quantity and quality, necessities and luxuries
- evaluate their own motives for buying things
- think about the long-term consequences of their consumption habits and draw conclusions about how their actions impact the environment

Lesson: Ads Add Up

Students will:
- identify the purpose of advertising and the messages conveyed by advertising
- identify the ways they are influenced to buy products and the negative aspects of overpurchasing or purchasing overpackaged products

Lesson: So Many Cookies.. So Much Packaging

Students will:
- discuss the purpose of packaging
- compare the different natural resources used in packaging
- determine that some packaging is easier to recycle than others
- decide whether packaging is necessary and appropriate

Lesson: Lunchroom Trash
Students will:
- take a first-hand look at excess packaging and determine ways to reduce waste

Lesson: Trash or Treasure?
Students will:
- recognize the many things that can be saved and reused
- realize that trading or reselling are good alternatives to throwing away
- identify reuse as an important way to help the environment

RECYCLING & COMPOSTING

Lesson: Cycles and Recycles
Students will:
- apply their knowledge of cycles to understanding the process of recycling
- identify recycling as a cycle that can help conserve natural resources

Lesson: Recycle Lifecycle
Students will:
- define the word recycle
- learn to recognize the universal symbol for recycling
- be aware that recycling is an alternative to disposal

Lesson: Composting In A Jar
Students will:
- examine how some wastes are recyclable through composting
- learn the vocabulary words decompose and compost

Lesson: Primary Songs
Students will:
- use familiar tunes to write lyrics about recycling and reusing materials
- learn and sing songs composed by other students and analyze what the lyrics mean
- (optional) make musical instruments out of discarded items and use them in the performance of their songs

HAZARDOUS WASTE

Lesson: Hazardous Products Substitutes
Students will:
- recognize signal words and visual symbols that indicate the presence of hazardous substances
- identify "how much" of various products would be dangerous to people or to the earth
- create a recipe book for safe substitutes for home use

Grades 4-5

ENVIRONMENTAL AWARENESS

Lesson: Our Natural Resources
Students will:
- recognize that the earth is the source of everything we make, use, and throw away
- differentiate between natural resources and human-made items and their associated life cycles

Lesson: Native American Culture
Students will:
- Learn about Native American culture and their relationships with the environment
- Understand that people from various backgrounds and other parts of the world may think differently about the world around them
- Practive map reading

Lesson: Famous Environmentalists
Students will:
- learn some historical facts from an environmental perspective
- understand how, over time, societal changes affected environmental discovery and preservation

SOLID WASTE

Lesson: There Is No Away!
Students will:
- recognize that there is no "away" in "throw it away"
- identify the destination of the waste they generate at home and at school

Lesson Objectives (continued)

- identify the negative aspects of dumping or burning trash
- learn the "solid waste hierarchy" for managing our trash

Lesson: Making a Model Landfill

Students will:

- construct in a bottle a model of a landfill and analyze the most effective design
- identify the way in which a landfill is different than a natural cycle
- identify the pros and cons of landfill disposal and alternative forms of disposal
- practice map reading

Lesson: Classroom Trash Audit

Students will:

- define, give examples, and sort waste
- identify the amounts of solid waste produced by individuals and groups

Extension: Take Home Trash Audit

Students will:

- estimate the amount of waste they personally create
- calculate the amount of waste they can save from landfills and incinerators if they recycle at different rates

Lesson: Spanish Lessons on Waste

Students will:

- broaden and strengthen second language skills
- learn vocabulary and issues surrounding solid waste in Oregon

WASTE PREVENTION & REUSE

Lesson: Wants and Needs

Students will:

- recognize the impact of humans on natural systems
- make predictions about the impact of certain behaviors (uses The Lorax by Dr. Seuss)
- assess factors that affect consumer purchases
- recognize that responsible consumer choices can result in reduced waste and environmental impact

Lesson: Buyer's Choice

Students will:

- assess the factors that affect purchases (their classmates and their own)
- recognize that a number of economic factors affect consumer choices and that some factors are environmental in nature

Lesson: Packaging: The Good, Bad, and Ugly

Students will:

- recognize natural resources in packaging
- identify the different purposes for packaging
- decide if packaging is necessary and appropriate

Lesson: Potato Ways

Students will:

- compare and contrast the price per pound of products to the amount of waste they generate
- analyze the positive and negative aspects of packaging

Lesson: Second Time Around

Students will:

- participate in two skits about reusing materials and write additional parts to the skits
- recognize the benefits of reuse
- develop ways to reuse a variety of products

RECYCLING & COMPOSTING

Lesson: We Can Recycle

Students will:

- learn what materials are recyclable in their community
- understand the role consumers play in "closing the loop" by purchasing recycled products
- understand how recycling mimics a natural cycle and how burying waste in a landfill breaks this cycle

Lesson: Popular Paper

Students will:

- explain the benefits of recycling paper and using fewer natural resources
- calculate answers to a variety of paper-production math problems

- understand the connection between natural resources used in manufacturing and recycling and the waste associated with each process

Lesson: All About Aluminum
Students will:
- use magnetism, appearance, and mass to differentiate between aluminum, tinned, and bimetal cans
- calculate answers to a math worhsheet
- understand the connection between natural resources used in manufacturing and recycling and the waste associated with each process

Lesson: Get To Know Glass
Students will:
- Learn about the process of making and molding glass, and the energy and natural resources used in the process
- calculate answers to a math worksheet
- understand the connection between natural resources used in manufacturing and recycling and the waste associated with each process

Lesson: Plastic Polymers
Students will:
- conduct a series of tests to determine the properties of different types of plastics
- audit the plastic waste generated in their homes
- understand the positive and negative impacts of using plastic, the barriers to recycling some forms of plastic, and the ways in which plastic is remade into new products

Lesson: Now You See It, Now You Don't
Students will:
- classify organic and inorganic objects
- construct a mini-compost garden
- record observations
- compare and contrast decomposition rates for organic and inorganic materials

Lesson: Natural Gardening
Students will:
- identify "non-point" sources of hazardous waste into the environment and their associated impacts
- learn about natural gardening as an alternative to using fertilizers and pesticides

HAZARDOUS HOUSEHOLD WASTE

Lesson: Hazardous Routes
Students will:
- identify ways people dispose of hazardous household waste
- identify the impacts these disposal methods have on health and the environment
- suggest safe alternative management routes for household hazardous wastes
- learn vocabulary:
- poisonous, toxic, hazardous, dangerous, flammable, ignitable, corrosive, reactive, irritant
- understand that the words "caution," "warning," and "danger" have special meaning and how it can affect children

Lesson: Safe Subs
Students will:
- identify safe substitutes for various hazardous household products
- create a recipe book of safe substitutes for home use

Oregon Benchmarks at a Glance: K-3

Subject	English	Math	Science	Social Science	Art	Health Education
Environmental Awareness						
Our Natural Resources			☺			
Cycles in Nature			☺			
Litter Hunt			☺		☺	
Native American Culture	☺			☺		
Solid Waste						
What is Trash?	☺			☺		
A Lot of Garbage		☺	☺			
Where is Away?	☺					
Look at a Landfill			☺	☺		
Waste Prevention & Reuse						
Wants and Needs	☺			☺		
Ads Add Up		☺	☺			
So Many Cookies...		☺	☺			
Lunchroom Trash		☺		☺		
Trash or Treasure?	☺				☺	
Recycling & Composting						
Cycles & RE-Cycles			☺	☺		
Recycle Lifecycle			☺	☺		
Composting in a Jar			☺			
Primary Songs	☺				☺	
Hazardous Waste						
Hazardous Products Substitutes			☺			☺

Oregon Benchmarks at a Glance: 4-5

Subject	English	Math	Science	Social Science	Art	Health Education
Environmental Awareness						
Our Natural Resources			☺	☺		
Native American Culture	☺			☺		
Famous Environmentalists	☺			☺		
Solid Waste						
There is No Away!	☺			☺		
Making a Model Landfill			☺			
Classroom Trash Audit		☺	☺			
Spanish Lessons on Waste						
Waste Prevention & Reuse						
Wants and Needs	☺			☺		
Buyer's Choice		☺		☺		
Packaging: The Good...	☺			☺		
Potato Ways		☺		☺		
Second Time Around	☺		☺		☺	
Recycling & Composting						
We Can Recycle			☺	☺		
Popular Paper	☺	☺				
All About Aluminum		☺	☺			
Get to Know Glass		☺	☺			
Plastic Polymers			☺			
Now You See It, Now You Don't		☺	☺			
Natural Gardening			☺			☺
Hazardous Waste						
Hazardous Routes	☺					☺
Safe Subs			☺		☺	☺

Spring 2003 & 2004 Science and Social Science Benchmarks*

Science

Physical Science: Common Curriculum Goals

- Understand the structure and properties of matter.
- Understand chemical and physical changes.

Grade 3 Benchmark

- Describe objects according to their physical properties.
- Describe changes that occur in matter.

Lessons: Cycles and RE-Cycles; Lifecycle Recycle

Grade 5 Benchmark

- Identify substances, as they exist in different states of matter.
- Distinguish among solids, liquids, and gasses.
- Identify unique properties of each state of matter.
- Describe the ability of matter to change state by heating and cooling.
- Recognize that heating and cooling cause changes in the state of matter.

Lessons: *Popular Paper; All About Aluminum; Get to Know Glass; Plastic Polymers; Now You See It, Now You Don't*

Life Science: Common Curriculum Goals

- Understand the characteristics, structure, and functions of organisms.
- Understand the relationships among living things and between living things and their environments.

Grade 3 Benchmark

- Describe the basic needs of living things.
- Describe a habitat and the organisms that live there.

Lessons: *Cycles in Nature; Litter Hunt*

Grade 5 Benchmark

- Describe the life cycle of an organism.
- Describe the relationship between characteristics of specific habitats and the organisms that live there.
- Recognize how all animals depend upon plants whether or not they eat the plants directly.

Lessons: *Our Natural Resources; Natural Gardening*

Earth and Space Science: Common Curriculum Goals

- Understand the properties and limited availability of the materials which make up the Earth.

Grade 3 Benchmarks

- Recognize physical differences in Earth materials.

Lessons: *Our Natural Resources; Cycles and RE-Cycles; Recycle Lifecycle*

Grade 5 Benchmarks

- Identify properties and uses of Earth materials.
- Recognize that Earth materials are used in different ways based on differences in their physical and chemical properties.
- Recognize that the supply of many resources is limited, and that resources is limited, and that resources can be extended through recycling and decreased use.
- Recognize that discarded products contribute to the problem of waste disposal.

Lessons: *Our Natural Resources; There is No Away; Wants and Needs; Spanish Lessons on Waste; Buyer's Choice; Second Time Around; We Can Recycle*

Scientific Inquiry: Common Curriculum Goals

- Formulate and express scientific questions or hypotheses to be investigated.
- Design safe and ethical scientific investigations to address questions or hypotheses.
- Conduct procedures to collect, organize, and display scientific data.
- Analyze scientific information to develop and present conclusions.

Grade 3 Benchmarks

- Make observations. Based on these observations, ask questions or form hypotheses, which can be explored through simple investigations.
- Plan a simple investigation. Collect data from an investigation.
- Use the data collected from an investigation to explain results.

Lessons: *Look at a Landfill; Recycle Lifecycle; Classroom Trash Audit; Composting in a Jar; Hazardous Products Substitutes*

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*Only science and social science benchmarks that relate to the Rethinking Recycling lessons are listed. Science Benchmarks take affect in 2003, Social Science in 2004.

Grade 5 Benchmarks

- Make observations. Ask questions or form hypotheses based on those observations, which can be explored through scientific investigations.
- Design a simple scientific investigation to answer questions or test hypotheses.
- Collect, organize, and summarize data from investigations.
- Summarize, analyze, and interpret data from investigations.

Lessons: *Making a Model Landfill; Classroom Trash Audit; All About Aluminum; Get to Know Glass; Plastic Polymers; Now You See It, Now You Don't*

Social Science

Economics: Common Curriculum Goals

- Understand that resources are limited (e.g., scarcity).
- Understand economic tradeoffs and how choices result in both costs and benefits to individuals and society.

Grade 3 Benchmark

- Understand that limited resources make economic choice necessary.

Lessons: *Wants and Needs; Ads Add Up; So Many Cookies...; Lunchroom Trash*

Grade 5 Benchmark

- Understand that all economic choices have costs and benefits, and compare options in terms of costs and benefits.
- Know that whenever a choice is made, there is a cost.
- Identify and give examples of the concepts of "trade-off" and "opportunity costs".
- Understand the difference between "needs" and "wants" and their relationship to economic tradeoffs.

Lessons: *Wants and Needs; Buyer's Choice; Packaging-The Good, the Bad, the Ugly!; Potato Ways; We Can Recycle*

Geography: Common Curriculum Goals

- Understand the spatial concepts of location, distance, direction, scale, movement and region.
- Understand how people and the environment are interrelated.

Grade 3 Benchmark

- View and draw simple maps and pictures to locate, describe, and show movement among places.
- Understand how peoples' lives are affected by the physical environment.

Lessons: *Native American Culture; Litter Hunt; Look at a Landfill*

Grade 5 Benchmark

- Know and use basic map elements to answer geographic questions or display geographic information.
- Use other visual representations to locate, identify, and distinguish physical and human features of places and regions.
- Understand how physical environments are affected by human activities.
- Understand how and why people alter the physical environment.
- Describe how human activity can impact the environment.
- Understand how human activities are affected by the physical environment.

Lessons: *Native American Culture; Making a Model Landfill*

History: Common Curriculum Goals

Interpret and reconstruct chronological relationships.

Grade 3 Benchmark

- Understand calendar time sequences and chronological sequences within narratives.

Lessons: *Native American Culture*

Grade 5 Benchmark

- Interpret data and chronological relationships presented in timelines and narratives.
- Order events found in historical narratives.
- Calculate time and infer information from timelines.

Lessons: *Native American Culture; Famous Environmentalists*

US History & State History: Common Curriculum Goals

- Understand and interpret events, issues, and developments within and across eras of US History.

- Understand and interpret the history of the state of Oregon.

Grade 5 Benchmark

- Understand how individuals, issues, and events changed or significantly influenced the course of US history from pre-history through the period of the American Revolution.
- Understand the impact of early European exploration on Native Americans and on the land.
- Understand how individuals changed or significantly influenced the course of Oregon state history.
- Understand the interactions and contributions of the various people and cultures that have lived in or migrated to the area that is now Oregon from pre-history through the period of the American Revolution.

Lessons: *Native American Culture; Famous Environmentalists*

Social Science Analysis: Common Curriculum Goals

- Define and clarify an issue so that its dimensions are well understood.
- Acquire and organize materials from primary and secondary sources.
- Explain various perspectives on an event or issue and the reasoning behind them.
- Identify and analyze the issue.
- Select a course of action to resolve an issue.

Grade 3 Benchmark

- Identify an issue or problem that can be studied.
- Gather information relating to an issue or problem.
- Identify and compare different ways of looking at an event, issue or problem.
- Identify possible options or responses, then make a choice or express an opinion.

Lessons: *What Is Trash?; Look at a Landfill; Hazardous Products Substitutes*

Grade 5 Benchmark

- Examine an event, issue or problem through inquiry and research.
- Gather, use and document information from multiple sources (e.g., print, electronic, human, primary, secondary).
- Identify and study two or more points of view of an event, issue, or problem.
- Identify characteristics of an event, issue, or problem, suggesting possible causes and results.
- Identify a response or solution and support why it makes sense, using support from research.

Lessons: *Classroom Trash Audit; We Can Recycle; Hazardous Routes*

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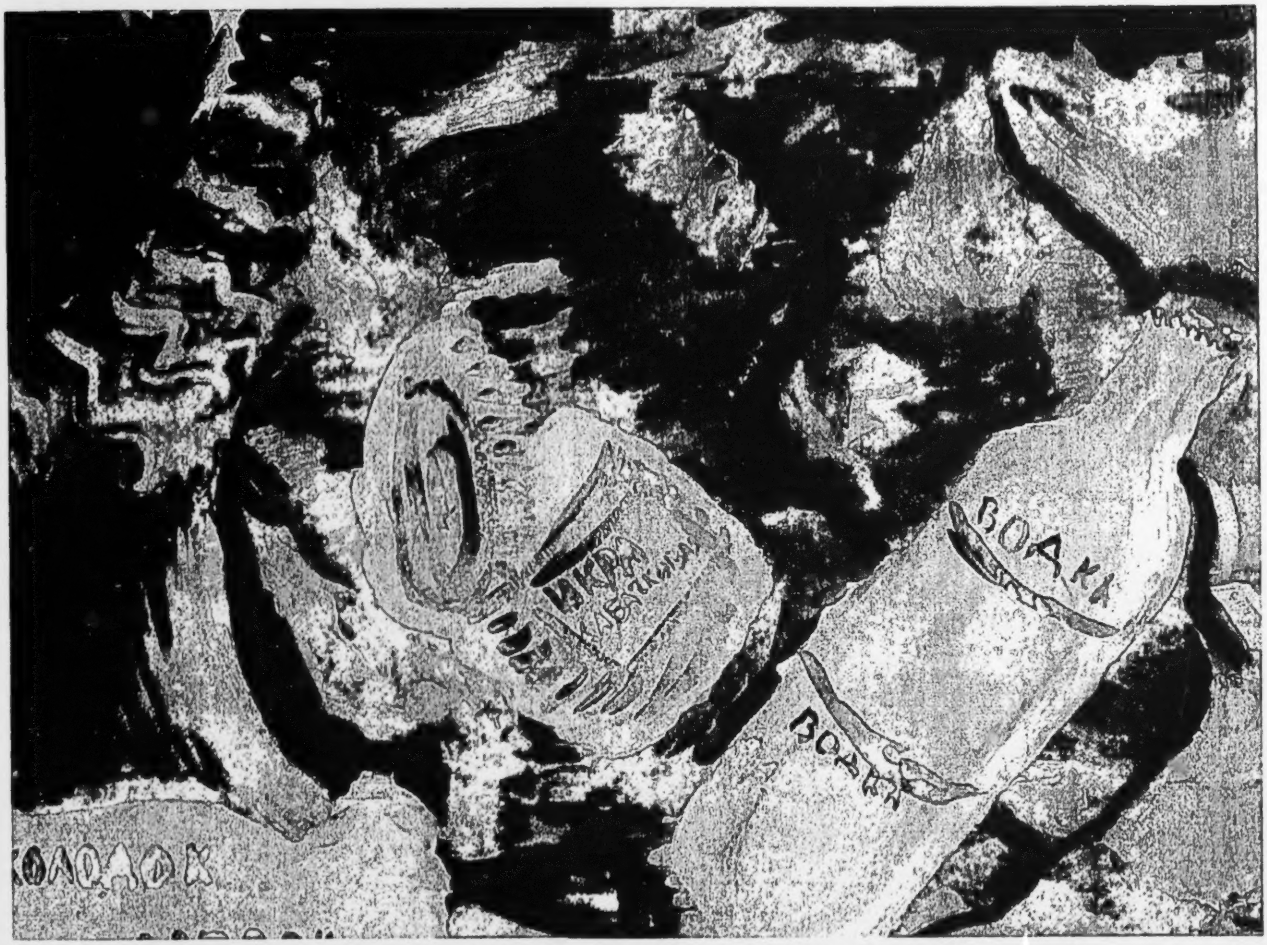
*Only science and social science benchmarks that relate to the Rethinking Recycling lessons are listed. Science Benchmarks take affect in 2003, Social Science in 2004.


ИКРА
ВОДКА
ВОДКА

Student environmental artwork from Khabarovsk, Russia - Portland's sister city.

Lesson: Our Natural Resources

Grade: K-3
Subject: Science
Objective:
Students will:

- differentiate between natural resources and man-made items
- describe how families use natural resources

Teaching Time: 30 minutes

Materials: 3x5 index cards; drawing paper; transparency, Natural Resource Tree; Worksheet: How Families Use Natural Resources

(Optional): Create a Natural Resource Bulletin Board (see Extensions in the Resources section).

REDUCE
REUSE
RECYCLE

Background:

Natural resources are the raw materials supplied by nature. Everything produced, used and thrown away originates from natural resources. People cannot create natural resources. Even though we use natural resources in our daily activities, we often do not even think of them as being resources. Use the following list for ideas for this activity.

Natural Resources	Activity	Products
air	fly kites, sail	balloons, tires, soccer balls
water	fish, swim, ski,	soft drinks, swimming pools, electricity
soil	dig for worms, grow a garden	sand boxes, glass
plants	climb trees, play on the grass	apples, bread, strawberries peanut butter paper, clothes (cotton), furniture (wood)
animals	playing with a pet, fishing, watching birds	hamburgers, cheese, milk, eggs, bacon, silk blouse, shoes (leather), wool sweaters
fossil fuels	watching TV, using computer games, heating our homes (natural gas) riding in a car or plane	plastic toys, gasoline, backpack, winter coats, electricity
minerals	climb on rocks, play at a playground	pop cans, bikes, cars, school desks, swing sets

Procedure:

- Before class, label each one of the seven index cards with the name of a natural resource.
- **Picture yourself standing in your backyard or in your favorite park. What do you see?** Get plenty of responses.
- **Everything that you have named is either a natural resource or is made from natural resources. Natural resources are all the things in nature which we use to live.**
- Show the transparency, Natural Resource Tree.
- List the seven natural resources on the board and show students the 3x5 cards with the name of one natural resource on each. Let each student choose a card (without looking) and give an example of how the student *enjoys* that resource or has a *product* made from that resource.
- Discuss how the product, like writing paper, is different from its source--a tree.

Reflection/Response:

- Have each student make a drawing or poster of his/her family enjoying natural resources. Don't forget to include products made from natural resources!
- **Can you think of anything that is not provided by the earth?**
- Have students complete the worksheet, "How Families Use Natural Resources In Their Lives."
- Ask students to describe what would happen if we used or polluted all or most of our natural resources like trees, oil, or rivers.
- Make a list on the board of suggestions for conserving natural resources such as:
    - not wasting products
    --don't take more napkins, towels or condiment packets than you need
    - using both sides of writing paper (or making note pads out of singled-sided used paper)
    - finding ways to reuse things: like glass jars, plastic tubs or bottles
    - collecting unwanted items at the end of the school year that are still useable and redistributing them the next school year
    - recycling as much as you can

Extension:

- Play "Find the Resource." Let one student name a manufactured object, such as a car. The first student to name a natural resource used in the object gets to offer the next man-made object.
- Make a Natural Resource Bulletin Board, see example page in the Resource section.
- Teach the importance of natural resource preservation. In a show and tell, have each student share their favorite item and list the resources used to make it. Discuss with the student what would be done if it were broken. Could it be repaired or used in some other way?

Common Curriculum Goal:

Science: Earth and Space Science

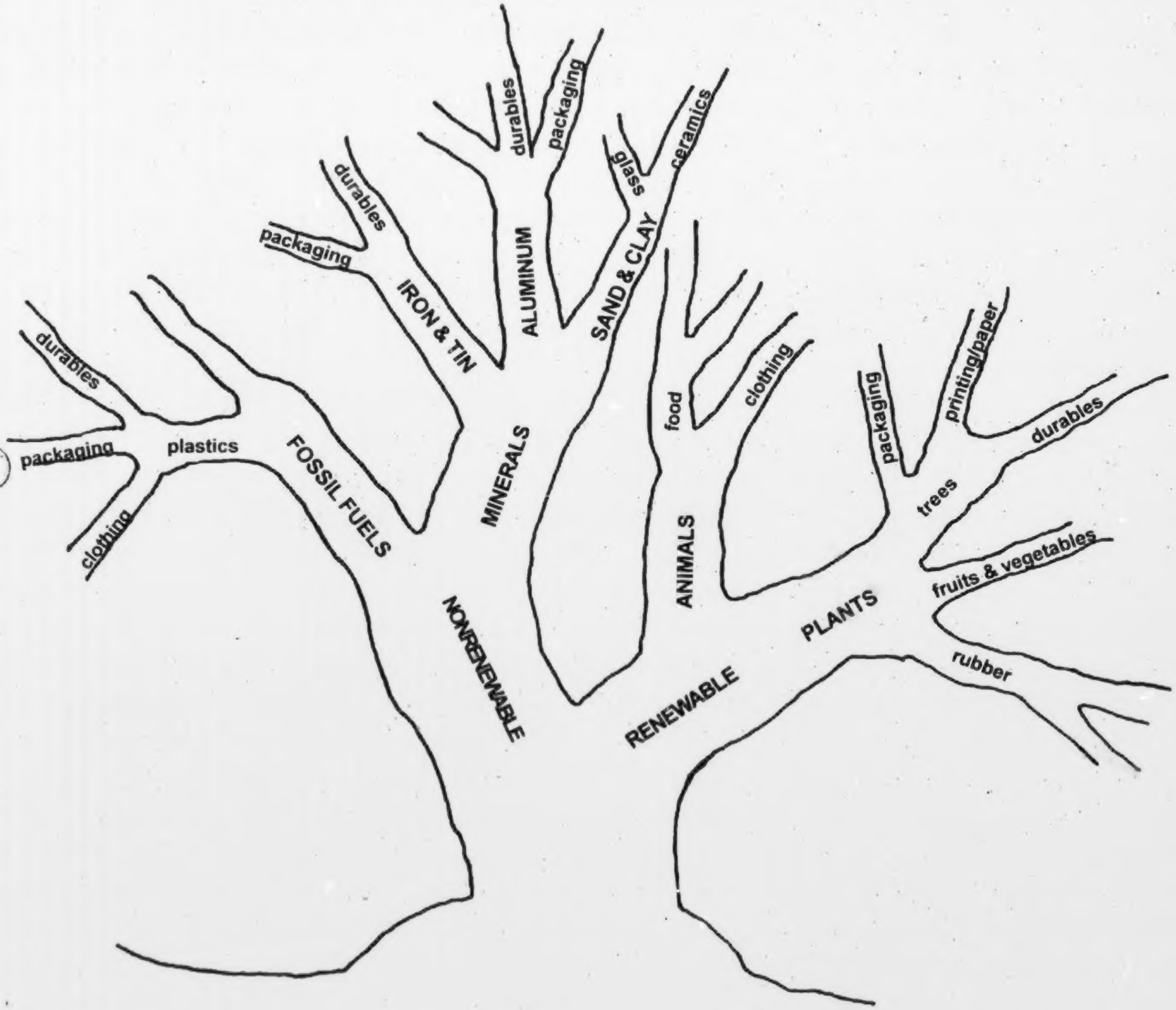
- Understand the properties and limited availability of the materials which make up the Earth.

Grade 3 Benchmark:

- Identify materials that make up the Earth.

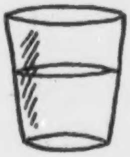
Overhead: Natural Resource Tree

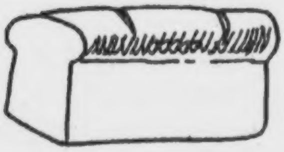
The earth is the source of everything we make, use, and throw away.

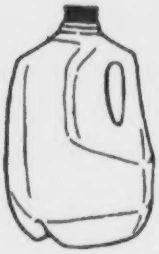

durables
packaging
plastics
clothing
FOSSIL FUELS
durables
packaging
IRON & TIN
durables
packaging
ALUMINUM
glass
ceramics
SAND & CLAY
MINERALS
NONRENEWABLE
food
clothing
ANIMALS
packaging
printing/paper
durables
trees
fruits & vegetables
rubber
PLANTS
RENEWABLE

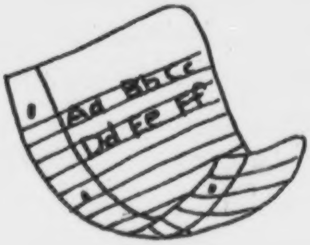
Worksheet: How Families Use Natural Resources

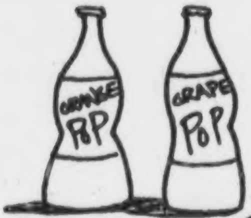
Draw a line from each thing on the left to the natural resource it came from on the right. Some pictures may match more than one resource, can you find them all?

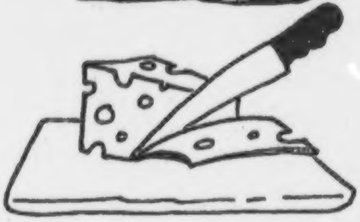


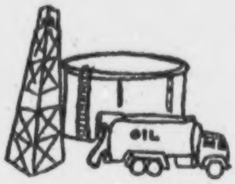


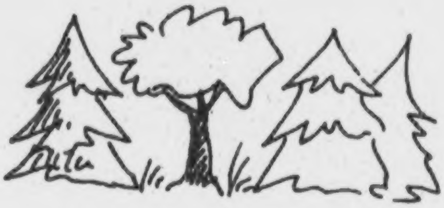


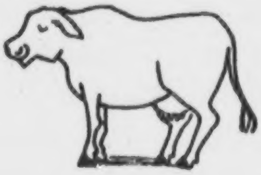

Aa Bb Cc
Dd Ee Ff

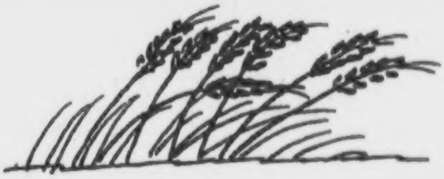

ORANGE POP
GRAPE POP

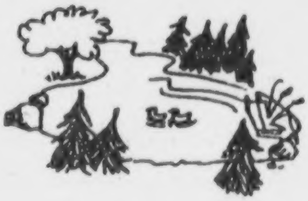


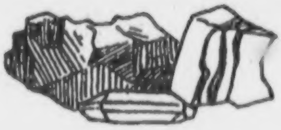












Source: Minnesota Office of Environmental Assistance: *Whata Waste K-6 Waste Management Education Curriculum*

Lesson: Cycles in Nature

Grade: K-3
Subject: Science, Math (extension)
Objectives:
Students will:

- recognize cycles in nature
- evaluate the usefulness of natural cycles

Teaching Time: 45 minutes

Materials: transparency, Cycles; worksheets, What's A (Tree) Cycle? and The Water Cycle

REDUCE
REUSE
RECYCLE

Background:

Cycles are a part of life. A cycle may go through changes, yet the changes eventually arrives back to where the cycle began. Cycles ensure that life can go through many changes, yet maintain its stability. In order to understand the concept of recycling, students must first understand cycles and their role in nature.

Procedure:

- **What does "cycle" mean? What other words include the word "cycle?"** (Most students will know bicycle or tricycle.) Point out that the "cycle" part of bicycle is the wheel, and that it goes around and around. Explain that cycles are an important aspect of life on earth, and that for something to be a cycle, it must always arrive back at the point of origin.
- Use the transparency Cycles or draw some simple cycles on the blackboard. Show how you can name all the many phases of a cycle: day-night, spring-summer-fall-winter, days of the weeks, months of the year.
- Give each student the worksheet, What's A Tree Cycle? and What's a Water Cycle to color, cut, and paste.
- Discuss the tree cycle and how the cycle provides for the continued life or survival of trees. Also, the water cycle makes it possible for all forms of life to continue on the earth.
- With older students, explain that cycles are important to our everyday lives. Have students draw a cycle of their typical day and week.
- **What would happen if every day or every week were completely different? What if there were no repeating patterns in our lives? Would you accomplish as much if you had to re-decide regular habits like brushing teeth, tying shoes, etc., every day?**
- **What if someone gathered up all the seeds and didn't let them get planted back in the ground?** If you've read The Lorax (See "Needs and Wants"), discuss how the cycle was broken in the story.

Reflection/Response:

- Have students describe, illustrate, or act out a natural cycle.
- For a homework assignment, ask students to find an example of a cycle at their home that they draw or write down to share with the class.

Extension:

- Create a classroom or school bulletin board using student artwork about cycles. See the Natural Resource Bulletin Board example in the Resource section.
- Have students write out the number of steps involved in each cycle they have discussed or identified.
- Assign the Activity: Environmental Fortune Teller in the Resource section.

Common Curriculum Goal:

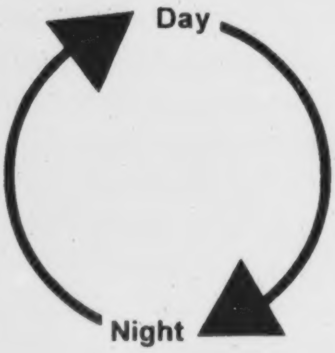
Science: Unifying Concepts and Processes

- Apply foundation concepts of change, cycle, cause and effect, energy and matter, evolution, perception, and fundamental entities.

Grade 3 Benchmark:

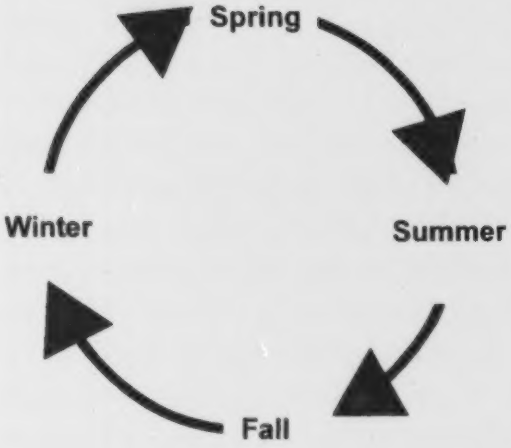
- Identify examples of change.
- Arrange parts of a cycle.

Overhead: Cycles



Day

Night

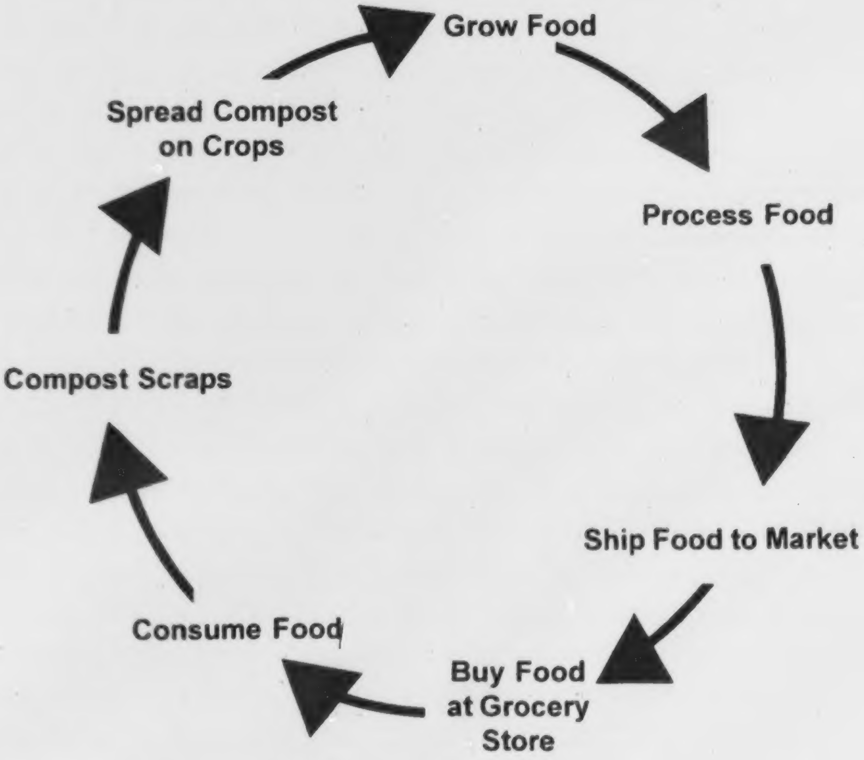


Spring

Summer

Fall

Winter



Grow Food

Process Food

Ship Food to Market

Buy Food at Grocery Store

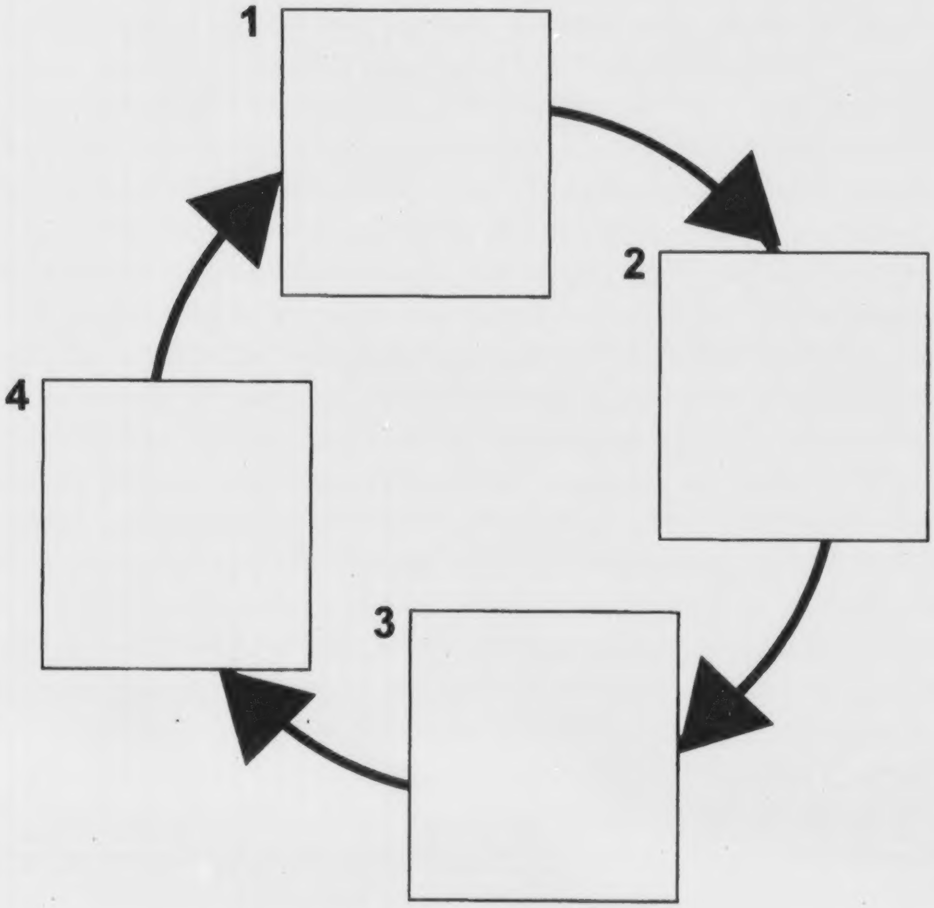
Consume Food

Compost Scraps

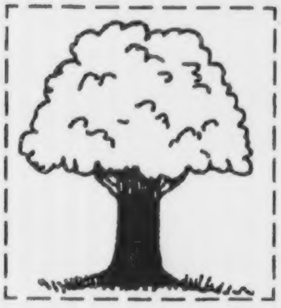
Spread Compost on Crops

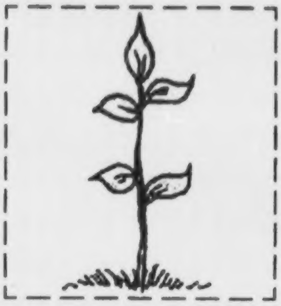
Worksheet: What's A Tree Cycle?

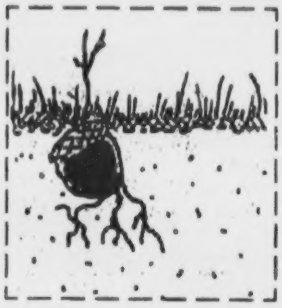
Student Name:____

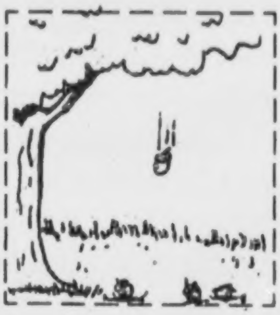


Cut, color, and paste the pictures into the correct order to show the cycle of a tree.





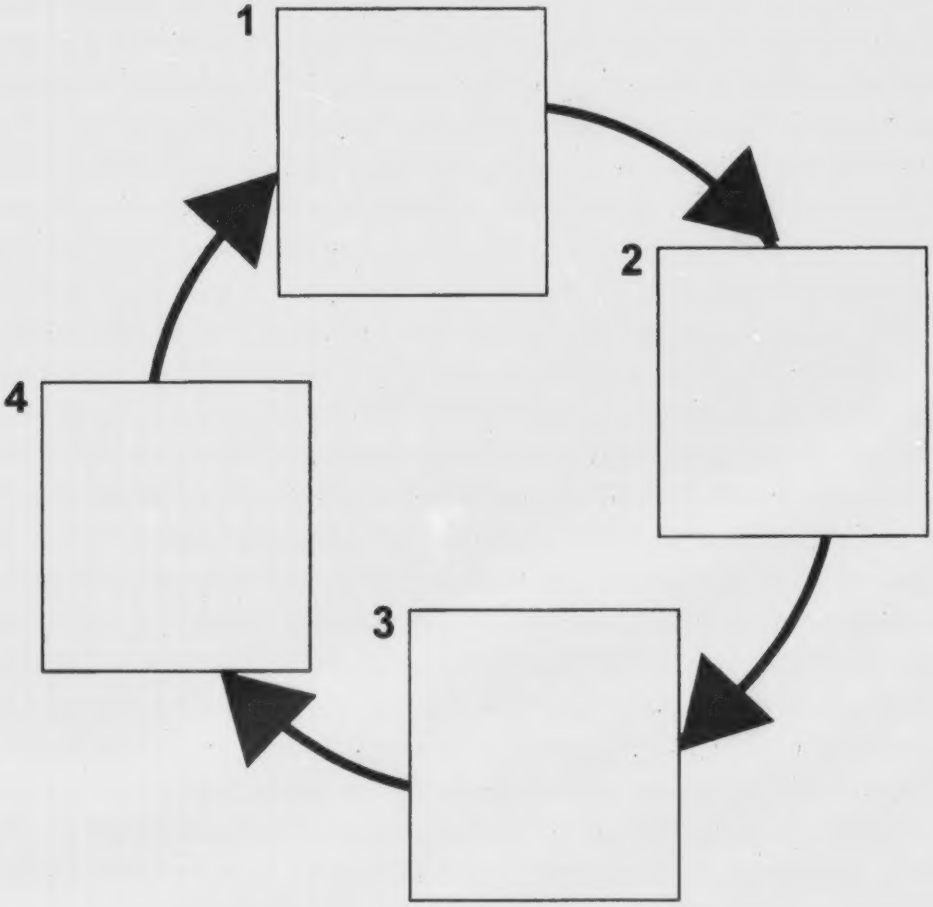




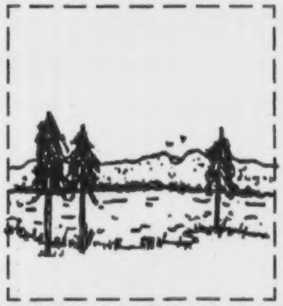
South Carolina Department of Health and Environmental Control: *Action for a Cleaner Tomorrow* (1996)

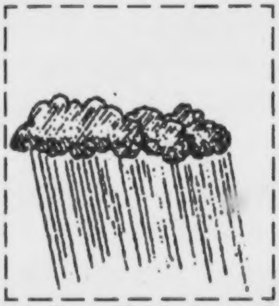
Worksheet: What's A Water Cycle?

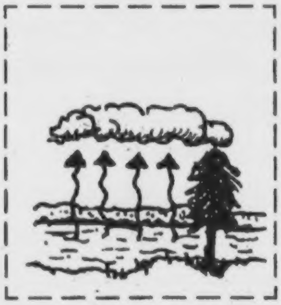
Student Name: ____

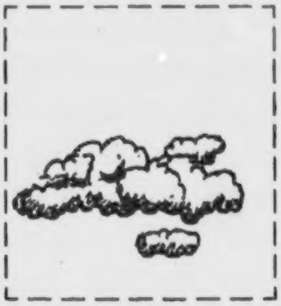


Cut, color, and paste the pictures into the correct order to show the cycle of water.









South Carolina Department of Health and Environmental Control: *Action for a Cleaner Tomorrow* (1996)

Lesson: Litter Hunt

Grade: K-3
Subject: Science, Arts
Objective:
Students will:

- define what litter is
- describe some effects of litter on the environment
- describe ways that students generate and prevent litter

Teaching Time: 30-45 minutes (half of which is searching time around the school)

Materials: collection bags for litter; surgical-type gloves; newspaper, cardboard or tarp (for sorting); worksheets, Litter Hurts Our World, Litter is Waste in the Wrong Place; transparency: Ways Litter Injures Wildlife

Background:

Litter is waste, trash, or garbage that is out of place. In other words, it has not been discarded properly. There are several sources or causes of litter: careless people walking and riding in cars, uncovered trucks, not enough trash cans, animals which scavenge in poorly covered trash cans of homes and businesses. Litter is ugly and dangerous for both people and animals. It costs time and money to clean up. Litter also wastes natural resources because in many cases, items could be recycled or reused. Some litter is accidental and some is deliberate.

Procedure:

- **What is litter?** After a few answers, take something from the waste basket and drop in on the floor, saying, **This is litter; it is waste that is out of place.**
- **What is wrong with litter?** Students should give many of the answers that are found above in the Background.
- **We are going on a litter hunt around our school to find waste out of place.** Supply each student or pairs of students with a collection bag and a pair of gloves. As you search inside and outside of the school, instruct students NOT to pick up any broken glass, sharp items, bathroom waste, or bandaids.
- Make a trip to the bathroom for all students to wash their hands to demonstrate that litter often has germs on it and can pass germs through the environment from the animals and people that come in contact with it.
- Dump the litter on some newspaper, cardboard or tarp, choose several pieces and ask, **How do you think this became litter? How does litter affect our school?**
- Show transparency, "Ways Litter Injures Wildlife." You may also want to note that other ways litter is dangerous that are not depicted on the overhead are human injuries, such as cutting yourself while walking barefoot and flat tires to bikes and cars.

Reflection/Response:

- Discuss with students why people should not litter. Identify how litter changes the natural environment and may change the way animals interact with their environment. Make a list of things people can do to prevent litter.
- Have each student color and complete the worksheet "Litter Hurts our World."
- Have each student color and complete the worksheet "Litter is Waste in the Wrong Place."

Extension:

- Sing the song, "Litter Is Garbage" in the Fun with Songs Section.
- Make up new words for the song.
- Have students make a decorated pledge card that they sign committing not to litter and to pick up pieces of litter around school and in their community to keep it beautiful and a nice place to live! Students should share this with their parents.

Common Curriculum Goal:

Science: Life Science

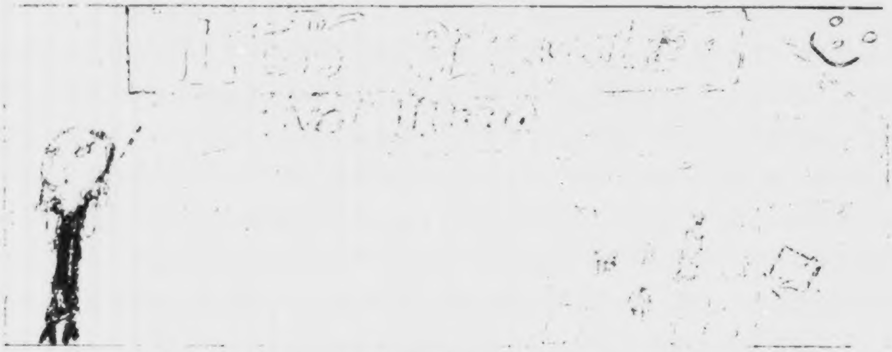
- Diversity/Interdependence: Understand the relationships among living things and between living things and their environments.

Arts: Create, Present, and Perform

- Express ideas, moods and feelings through various art forms.

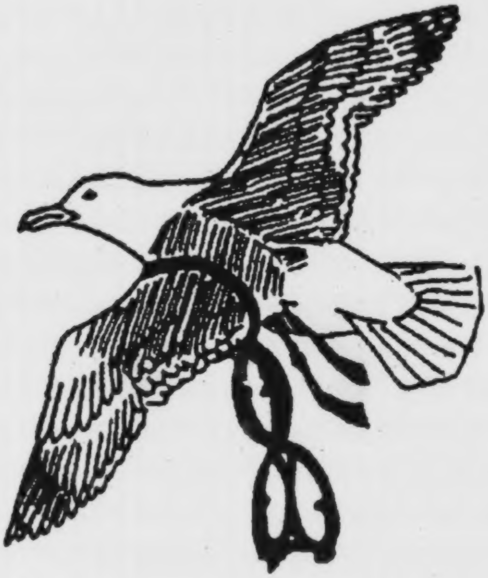
Grade 3 Benchmark:

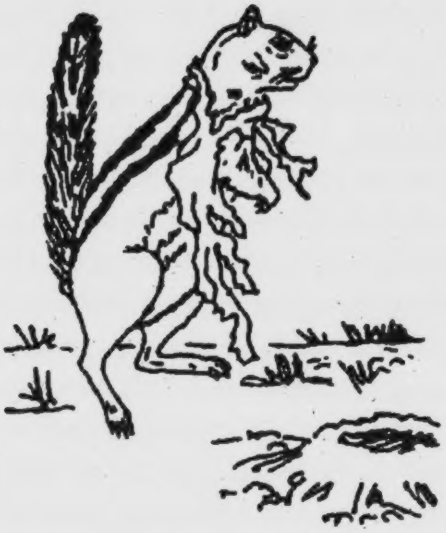
- Describe a habitat and the organisms that live there.
- Communicate, using a simple vocabulary related to various art forms.

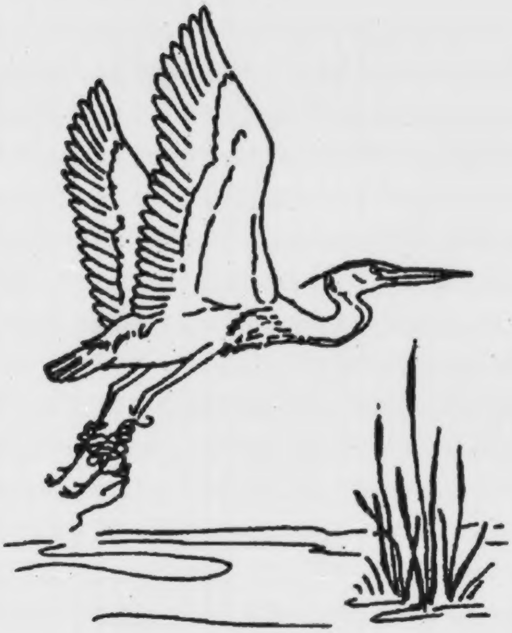


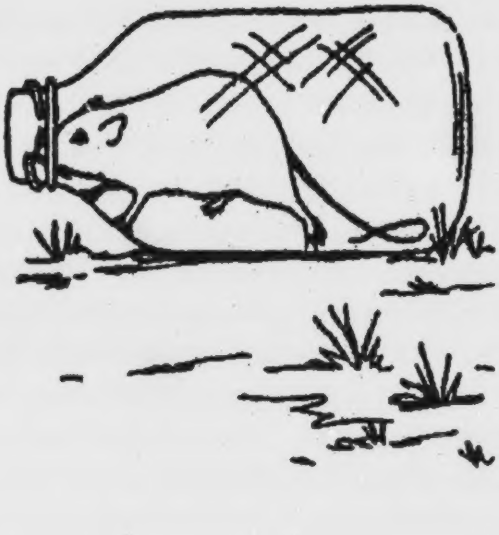
Olivia Eggers, Grade 2, Bridgeport Elementary School, Tigard-Tualatin SD 23J, submitted for the Metro Regional Services Earth Day Billboard Contest, 2001.

Overhead: Ways Litter Injures Wildlife



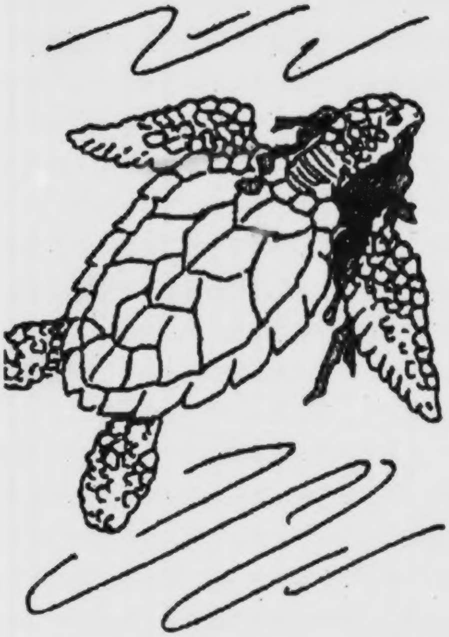


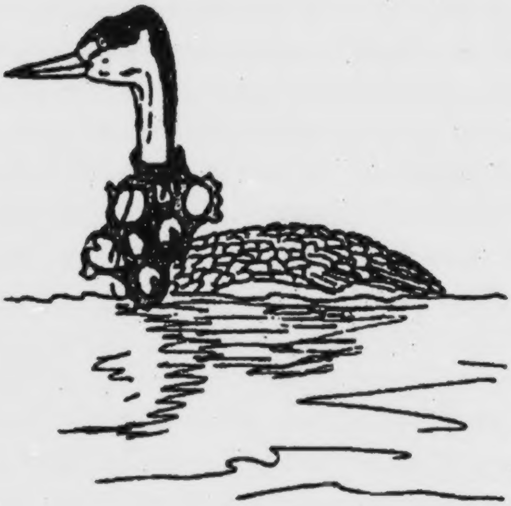


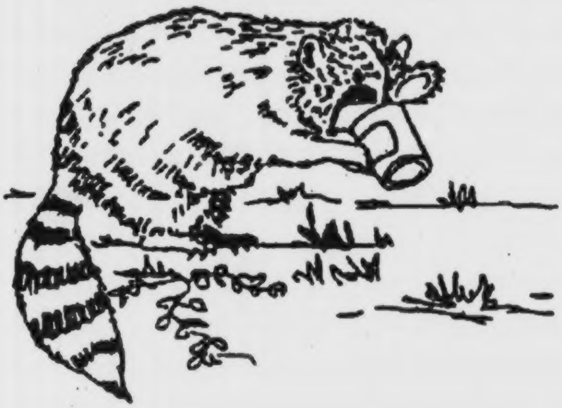


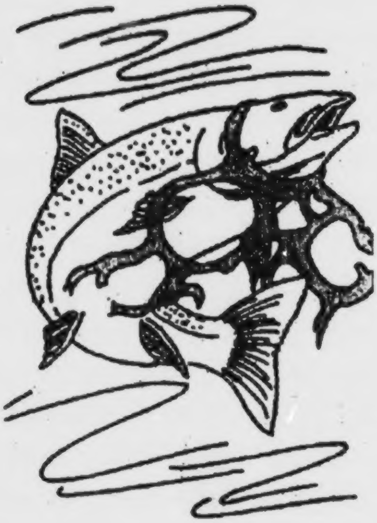
Source: California Integrated Waste Management Board: *Closing the Loop: Exploring Integrated Waste Management and Resource Conservation K-6* (2000)

Overhead: Ways Litter Injures Wildlife





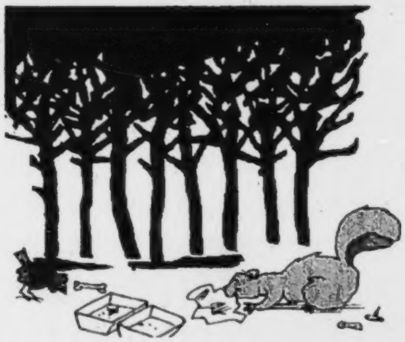


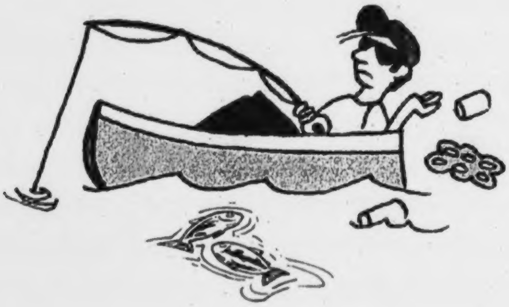


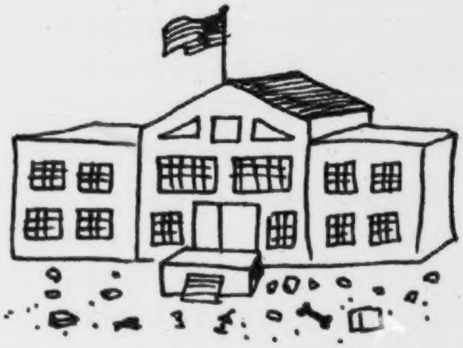
Source: California Integrated Waste Management Board: *Closing the Loop: Exploring Integrated Waste Management and Resource Conservation K-6* (2000)

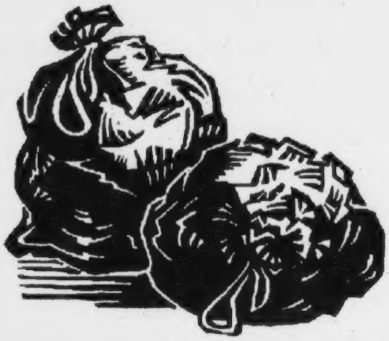
Worksheet: Litter Hurts Our World

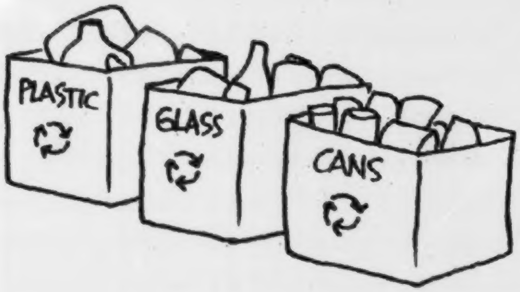
Circle each picture that shows a bad thing that can happen when we throw away waste improperly. You will need to draw 4 circles. Label each picture to describe the good and bad things shown.

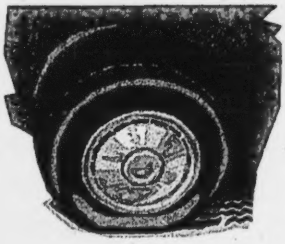








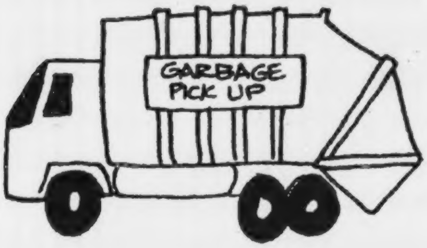


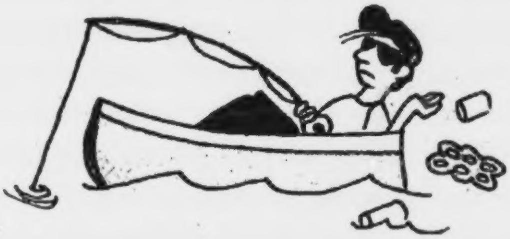


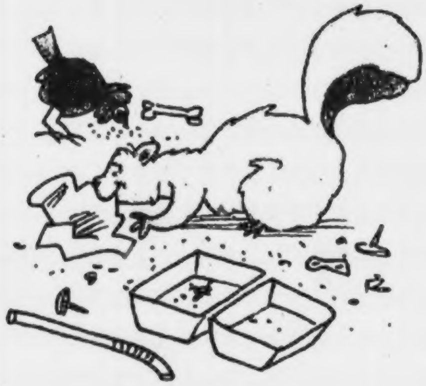
Source: Minnesota Office of Environmental Assistance: *Whata Waste K-6 Waste Management Education Curriculum*

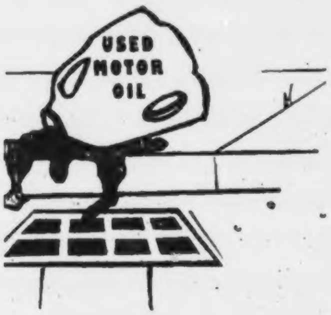
Worksheet: Litter Is Waste In The Wrong Place

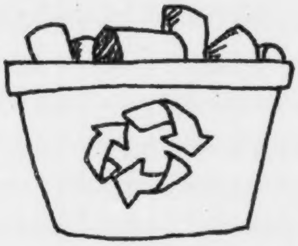
Circle each picture that shows an example of littering, or putting waste in the wrong place. Draw a square around each image that is an example of putting waste in the right place. You will need to draw 5 circles and 3 squares.

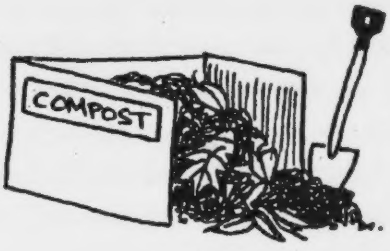


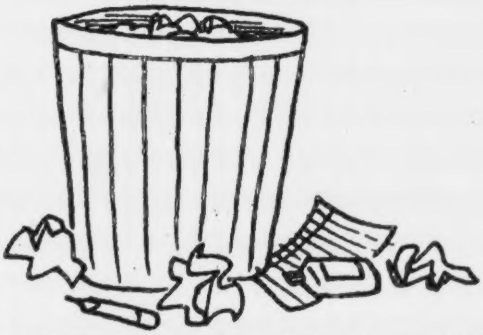


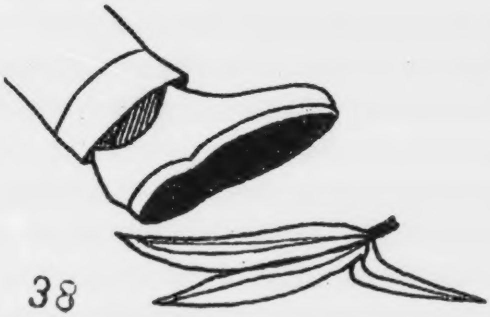












Source: Minnesota Office of Environmental Assistance: *Whata Waste K-6 Waste Management Education Curriculum*

Lesson: Native American Culture

Grade: K-3
Subject: English
Objectives:

- learn about Native American culture and their views and relationships with the environment
- understand that people from various backgrounds and parts of the world can think differently about the world around them

Teaching Time: Varied (depending on the teacher's overview of the subject)

Materials: Transparency, Oregon Tribes Map; Handout, Native American Poetry and Pacific Northwest Native American Tales

(Optional:) Native American Play, "The Strongest One" (in the "Play" section of the resource guide).

Vocabulary:
stewardship
culture

REDUCE
REUSE
RECYCLE

Background

In order to provide students some perspective on environmental issues, it is important to help them understand that people from other cultures and countries may think differently about the world around them. Americans of European descent brought their own values to the United States which resulted in densely populated cities, industrialization, and deforestation, for example. By viewing the environment as something that can be manipulated rather than something that can be coexisted with, we now live with many environmental problems. After going through this lesson, students should be able to appreciate that people have different cultural perspectives and that our own "cultural values" may have to be examined in order to protect the earth.

In order to discuss Native American themes concerning the environment, students should already have some historical context of early America, Native Americans and the first European settlers. This lesson could compliment your lessons about Lewis & Clark and the Oregon Trail, for example.

You may wish to focus more in depth on tribes in the Northwest or located within Oregon. However, specific poetry and lore from Northwest Native American tribes is not as easy to find as poetry from other tribes in the U.S. There is a list of potential resources on NW tribes at the end of this lesson, for your convenience. You may also wish to read or teach from the books listed in the resource section in "Children's Books" under Native American/Other Cultures.

The following is a partial list of Oregon tribes that you may want your class to study. Tribes marked with an asterisk no longer exist primarily due to diseases brought from settlers; changes in the environment such as mining, logging, or river damming; and reservation relocation.

Alsea*
Burns Paiute
Cayuse
Celilo Wy-um
Chastacosta*
Chinook
Clatsop*
Coos
Coquille
Cow Creek Band
Fort McDermott
Grand Ronde
Kalapuya
Klamath
Kuitsh*
Kwalhioqua*
Latgawa*
Lower Umpqua
Modocki
Molalla
Rogue River
Siletz
Siuslaw
Takelma*
Tillamook
Umatilla
Upper Umpqua
Walla Walla
Warm Springs
Wasco
Yoncalla

Procedure:

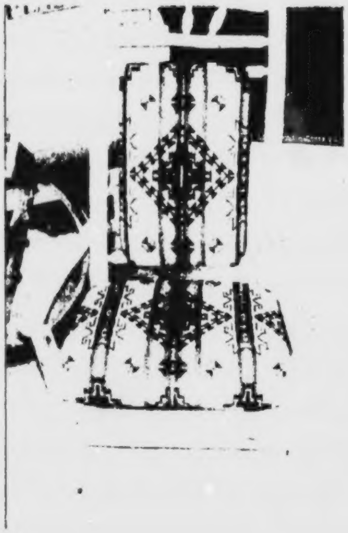
Depending on the skill level of your class, read to the class or assign selections of Native American Poetry, Folk Tales, and the Play "The Strongest One" to members of the class to read aloud and discuss the Oregon Tribes Map in relationship to where you are located.

Reflection/Response:

DISCUSSION

- **In the poem, "I Look at You", what is the main idea? How does the author describe the way Native Americans value nature and the environment?**

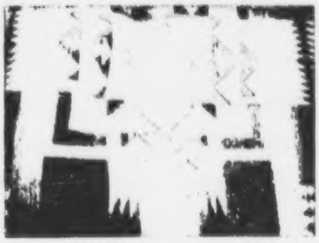
- **What words or phrases does the author use to convey appreciation for the environment?**
- **What natural resources (the things that we use that come from nature) does she identify in the poem?** (berries, rocks, trees, buffalo, etc.)
- Discuss how you would feel if you lived in a society where you or your family made their own clothes, hunted and fished for their own food, and walked, rode horses, or took a canoe to get somewhere.
- **Can you name some types of pollution that would be lessened by living this way?** (List responses on the board--students should identify less air pollution from factories and cars, less chemicals from factories, less waste produced because people use the natural resources around them.)
- **Even though today, Native Americans and other U.S. citizens live in a "modern society" with electricity, cars, and lots of things for our homes and offices, can you think of some ways we can lessen our impact on the environment?** (List the responses on the board: examples include: riding a bike, recycling, reusing things, donating unwanted clothes, learning to take and buy only what we really need and thinking about the things we buy and how they impact the earth--natural resource extraction, transportation to market, etc.)
- **In the Poem, "The Wind Picks Up", what natural process is the title predicting will happen?**
- **Does the author feel good or bad about the rain storm? What words does the author use to convey mood? Why is her view of the rain positive, when most people think of the rain as negative? Is her viewpoint fact or opinion? Which perspective or viewpoint is the correct one? Does the "correct" viewpoint depend on where you live or who you are?**
- Discuss the ways in which people depend on natural resources such as wind, rain, plants, and animals in order to live.
- Native Americans have a long cultural history of coexisting with plants and animals, discuss how this is different from "modern society". Bring out ideas like: we raise certain animals on large farms to produce food like chicken, beef, milk and cheese instead of hunting for our food; and grow plants like corn and wheat on a large scale using pesticides and fertilizers, etc. Help students understand that while these changes have "modernized" society, but they have also created much more pollution in the air, water and land that we have to deal with over the long term.
- **Which story from "Pacific Northwest Native American Tales" did you like the best?** Have several students answer and explain why they liked the story.
- **What is the main idea or theme that these three stories have in common? Do you think it is important to respect nature and the animals that live around us? Why or why not?**



Example of Native American furniture. Photo taken at the Confederated Tribes of the Umatilla Indian Reservation.

(Optional)

- Perform the Play "The Strongest One"
- **What does this play make you think about?**



- **What are the relationships between the plants, animals and natural resources mentioned in the play?** (Lead the students to understand that life is a cycle and that all things are interconnected, for example plants need the sun to grow, animals eat the plants, people eat the animals, etc.)
- **Why do you think that Native Americans tell folk stories to their children?** To help them gain a "sense of place", in other words to understand the environment in which they live and to learn to respect the natural things around them.
- **Why is it important to respect our surroundings and understand the relationships of nature?** Because we have to learn to coexist with the earth. For example, it is okay to use trees to make wood for our houses and to make paper, but if we take too many, we are destroying the homes for animals in the wild. Also, if we cut too many trees in one area, rain makes the soil run into our rivers, lakes and streams which can kill the fish.
- Discuss the concept of "stewardship" and help students understand that no matter what our cultural values are, it is important to think of ourselves as stewards of the earth so that we can leave a happy, healthy environment for future generations.

Extensions:

- Have students write/present their own play or folk tale about something in the environment.
- Some subject examples include: Why do the seasons change?, Why does the sun rise and set?, Why do some animals come out only at night?, Why do salmon migrate from the river to the ocean and back?

Oregon Common Curriculum Goal:

English: Reading and Literature

- Recognize, pronounce, and know the meaning of words in text.
- Demonstrate literal comprehension of a variety of printed materials.
- Demonstrate evaluative comprehension of a variety of printed materials.
- Read a variety of literary forms of varying complexity from a variety of cultures and time periods.

Social Science: Geography

- Understand spatial concepts of location, distance, direction, scale, movement and region.

Grade 3 Benchmark:

Students will:

- use context clues to choose the correct meaning of words
- identify a sentence or statement indicating the main idea of the selection
- draw conclusions about the author's motivation or purpose, probable reasons for actions or beliefs, whether identified portions of the passage are fact or opinion
- view and draw simple maps and pictures to locate, describe, and show movement among places.

REDUCE
REUSE
RECYCLE

Resources to find information on Northwest Native American tribes:

The First Oregonians. Eds. Baun, Carolyn M. and Richard Lewis. Portland: Oregon Council for the Humanities, 1991.

Beckham, Stephen Dow. *Native America in the Twentieth Century: An Encyclopedia.* Ed. Mary B. Davis. New York: Garland Publishing, 1994. *The Indians of Western Oregon: The Land Was Theirs. Coos Bay: Arago Books, 1977.*

Deloria, Vine, Jr. *Indians of the Pacific Northwest, From the Coming of White Man to the Present Day.* Garden City, NY: Doubleday, 1994.

Gale Encyclopedia of Native American Tribes, Vol 10. Ed. Sharon Malinowski & Anna Sheets. Detroit: Gale Publishers, 1998.

Rafe, Martin. *The Boy Who Lived with the Seals.* (Chinook Legend). New York: G.P. Putnam's Sons, 1993.

Ruby, Robert H. and John A. Brown. *A Guide to Indian Tribes of the Pacific Northwest.* Norman: University of Oklahoma Press, 1992.

Seaburg, William R. and Jay Miller. *Handbook of North American Indians, Vol 7: Northwest Coast.* Ed. Wayne Suttles. Washington DC: Smithsonian Institution, 1990.

Trafzer, Clifford E. (Wyandot). *Chinook.* New York: Chelsea House Publishers, 1990.

Internet sources:

Chinook Tribe: *www.chinook-art.com*
Cow Creek Band: *www.cowcreek.com*
Grand Ronde: *www.grandronde.org*
Klamath Tribes: *www.klamathtribes.org*
National Museum of the American Indian: *www.nmai.si.edu*
Siletz Tribes: *http://ctsi.nsn.us*
Umatilla Tribes: *www.umatilla.nsn.us*
Warm Springs Tribes: *www.warmsprings.com*

From the Objiwe People

I Look at You

I look at you and my mind drifts back to
    A time of peace and honesty
    A time of honor
    A time when all our people
        spoke our Native language
        and were proud to wear
        eagle feathers and beads.
    A time of dancing and giving thanks
        for all that Mother Earth
        gave our people:
        buffalo that roamed the grasslands
        fish that swam in clear blue rivers and lakes
        trees that our canoes were made from
        horses our people rode
        natural spring water pure and cool
        berries, roots, and bulbs, grown in rich soil
        rocks people used to tan hides
        stones our people used for arrow tips
Then I wish our people had that time again:
        A time of peace and honesty
        A time of honor.

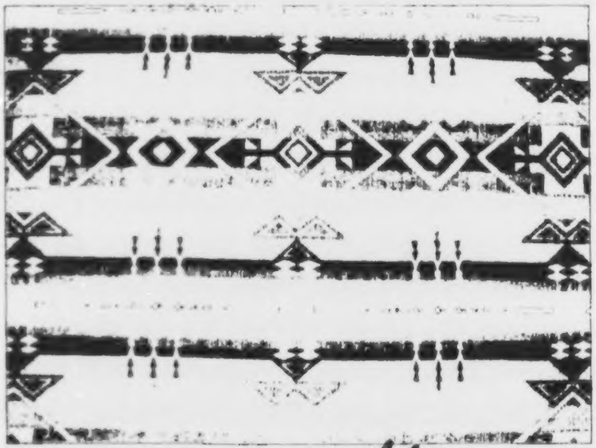
- Kelly Hill (White Earth Minnesota Chippewa, Mississippi Band)
Grade 10; age 16; Nay Ah Shing School, Onamia, Minnesota
excerpted from: When the Rain Sings: Poems by Young Native Americans, Simon & Schuster (1999).

From the Tohono O'odham People

The Wind Picks Up

The wind picks up
the cold air blows
the clouds bring
the loud sound
of thunder and the
flashing lightning.
The animals go to
their homes
and the people come
out and enjoy the rain.
The smell of soil:
the rain falls just enough
to make a few puddles
then the rays of the sun
peek through the clouds
and the animals
come out and play
and soon
the sun is out
the puddles of water
and the sun create
a rainbow
that stretches across
the desert making even more beauty.

- Rayna Two Two (Tohono O'odham)
Grade 8; age 14; Baboquivari High School, Sells, Arizona
excerpted from: When the Rain Sings: Poems by Young Native Americans[2]



Pacific Northwest Native American Tales

From the Tillamook People

South Wind and Frog

Water was very scarce at that time. There were no rivers, Frog alone had water which she kept in a basket water bucket. Anyone who wanted a drink of water had to go to Frog and ask for it. South Wind came to Frog; he said, "Auntie, I want a drink of water." "Confound it!" she said. "Everybody's drinking my water." She gave him a small drink, just a certain amount and no more. South Wind thought, "It is indeed terrible that there is no water. Water should be free." He left her and he hunted for a long rock that he could grasp in his hand. He watched for his opportunity; and he hit her on the head. He knocked Frog senseless and South Wind took Frog's water; he emptied out that bucket; he threw water all around. He spoke, "That shall be rivers. All over the land there shall be rivers and creeks. Nobody shall own water, no one person."

excerpted from: Nehalem Tillamook Tales by Melville Jacobs.

From the Makah People

When the Birds and Animals were Created

When the world was very young, there were no people on the earth. There were no birds or animals, either. There was nothing but grass and sand and creatures that were neither animals nor people but had some of the traits of people and some of the traits of animals.

Then the two brothers of the Sun and the Moon came to the earth. Their names were Ho-ho-e-ap-bess, which means "The Two-Men-Who-Changed-Things." They came to make the earth ready for a new race of people, the Indians. The Two-Men-Who-Changed-Things called all the creatures to them. Some they changed to animals and birds. Some they changed to trees and smaller plants.

Among them was a bad thief. He was always stealing food from creatures who were fishermen and hunters. The Two-Men-Who-Changed-Things transformed him into Seal. They shortened his arms and tied his legs so that only his feet could move. Then they threw Seal into the Ocean and said to him, "Now you will have to catch your own fish if you are to have anything to eat."

One of the creatures was a great fisherman. He was always on the rocks or was wading with his long fishing spear. He kept it ready to thrust into some fish. He always wore a little cape, round and white over his shoulders. The Two-Men-Who-Changed-Things transformed him into Great Blue Heron. The cape became the white feathers around the neck of Great Blue Heron. The long fishing spear became his sharp pointed bill.

Another creature was both a fisherman and a thief. He had stolen a necklace of shells. The Two-Men-Who-Changed-Things transformed him into Kingfisher. The necklace of shells was turned into a ring of feathers around Kingfisher's neck. He is still a fisherman. He watches the water, and when he sees a fish, he dives headfirst with a splash into the water.

Two creatures had huge appetites. They devoured everything they could find. The Two-Men-Who-Changed-Things transformed one of them into Raven. They transformed his wife into Crow. Both Raven and Crow were given strong beaks so that they could tear their food. Raven new people would have fruit and could use the cherry bark for medicine.

Photo by Gregory Gough

A thin, tough creature they changed into the alder tree, so that the new people would have hard wood for their canoe paddles.

Thus the Two-Men-Who-Changed-Things got the world ready for the new people who were to come. They made the world as it was when the Indians lived in it.

Excerpted from the "Native American Lore Index" page hosted at: http://www.ihawaii.net/~stony/loreindx.html

From the Umatilla people

THE BOY AND THE EAGLE [Hots-Wal ka Wap-tesh]

To the Indian, the eagle is held in high regard. The feathers are used in ceremonies and as part of some clothing. For instance, the feathers are attached to a staff and used like a flag.

This story is about a boy who saved the lives of young eagles and how the mother eagle helped. The boy had been fishing and was taking a short cut home when he was bitten by a rattlesnake. An eagle had been watching the snake. She flew down and killed the snake and took it to feed her young. At that time people and animals could talk to each other. The boy asked the eagle to help him. The eagle flew to a low marshy place and gathered medicinal grasses and seeds which the boy wrapped around the place where the bite was. Soon it healed enough so he could go on home.

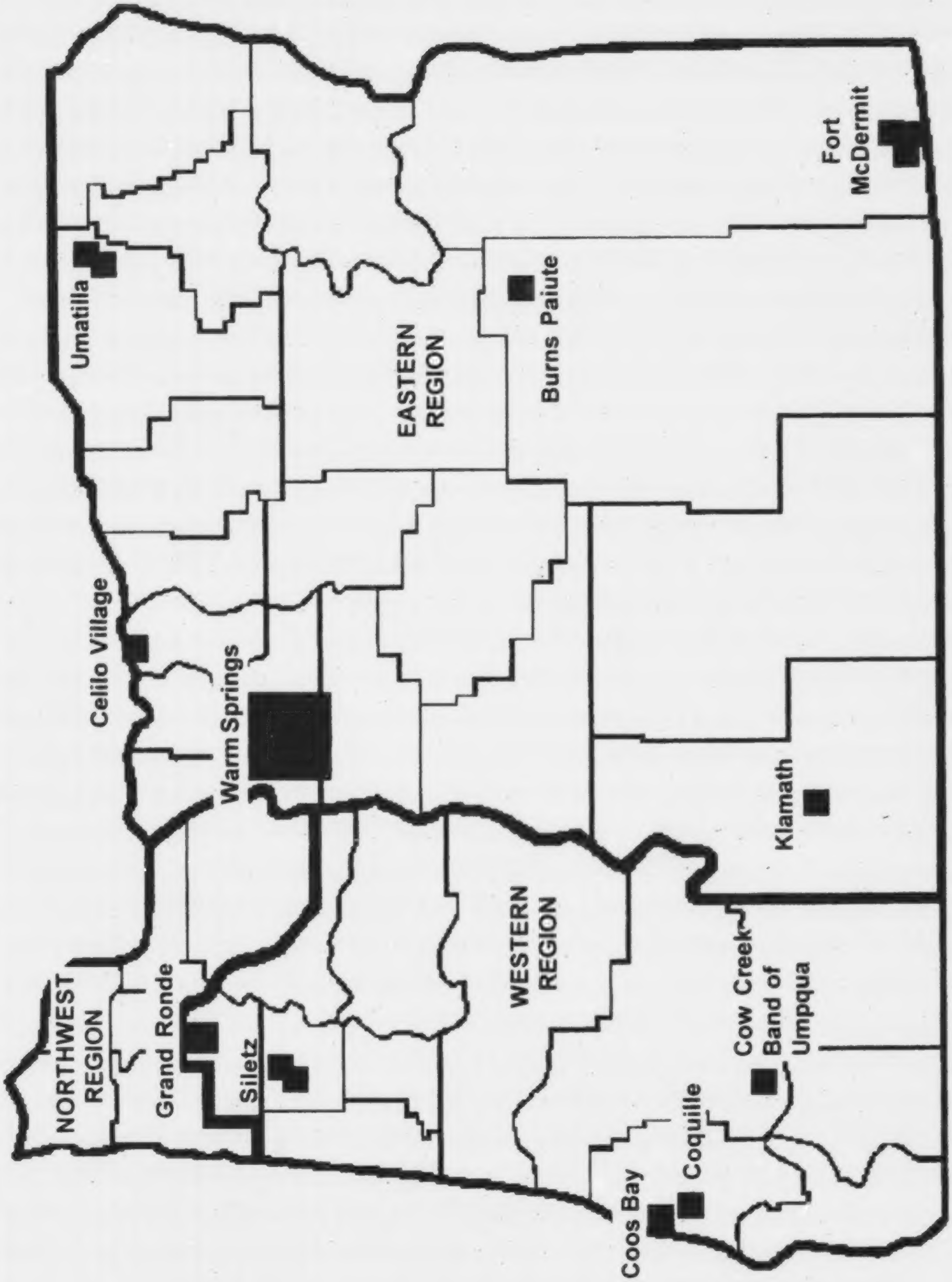
One day the boy decided to go fishing again, and on his way home he met a group of bad boys who had a bunch of eagle feathers. He knew that they must have killed the parent eagles. He looked for them and found them both dead. He climbed the high bluff and found two young eagles who were much too young to go out and find food for themselves. He fed them the fish he had caught and made them comfortable.

Every day or so he would take them some food like snakes, mice, frogs, and fish. They grew fast and strong and were soon trying their wings for flight. Soon they were finding small animals to eat and flying further away from the nest. One day they were gone from the nest and never returned. Sometimes eagles would be seen flying high in the air.

Oh yes, there is a certain time of year when the eagles lose their feathers, so they would let the boy pick what he wanted.

Told by Esther Lewis
excerpted from the "Traditions" page on the Umatilla website: http://www.umatilla.nsn.us

Oregon Tribes Map


Umatilla
EASTERN REGION
Burns Paiute
Fort McDermit
Celilo Village
Warm Springs
Klamath
NORTHWEST REGION
Grand Ronde
Siletz
WESTERN REGION
Cow Creek Band of Umpqua
Coquille
Coos Bay

Lesson: What Is Trash?

Grade: K-3
Subject: Social Studies, Reading
Objective:
- define garbage (waste, trash)
- reevaluate waste as a more productive resource

Teaching Time: 30 minutes

Materials: excerpts from E.B. White's *Stuart Little* and *Charlotte's Web* or read the entire stories if desired. Extension: *Throwing Things Away* by Lawrence Pringle or other book of choice--see "Children's Books" section of the Teacher Resources.

Concept adapted from the Association of Vermont Recyclers: *AVR Teacher's Resource Guide For Solid Waste and Recycling Education (reprinted 1999)*

REDUCE
REUSE
RECYCLE

Background:

In 1999, Oregon disposed of 2.8 million tons of garbage. (See "Where Is Away?" Background for more details about solid and hazardous waste disposal). The terms "waste" and "resource" are relative and reflect our own needs and values rather than any objective quality of an object. Another way to think about waste is simply "resources for which we have not yet found a use." Making the connection between garbage and resources will determine how effective we are in reducing wastefulness.

Procedure:

- **What do you think of when I say 'garbage'?** Many will probably have a negative reaction. **What are some synonyms for the word 'garbage'?** (Refuse, rubbish, trash, waste).
- **I am going to read to you about someone who probably feels the same way as you do about trash. Stuart Little is a mouse who lives in the city and is always getting into trouble. This is about one of Stuart's misfortunes, when he accidentally gets caught in a garbage can!**
- Discuss how Stuart feels about garbage and why he doesn't like it.
- **Now let's read about another E.B. White character from the book *Charlotte's Web*.**
- **How did Wilbur feel about garbage? How did he think differently than Stuart Little?** Point out that Wilbur's garbage was useful and not wasted. Our garbage can also be a resource. (One person's trash is another person's treasure!) Brainstorm possibilities, including composting (See "Composting in a Jar" to teach students about turning green waste into nutrients), tree houses out of construction debris, fixing broken toys, using glass jars for storage, etc.
- Bring the students back to *Stuart Little*; find out what happens to him.
- Discuss that what happens to Stuart, happens to all garbage (it is dumped on the planet).

Reflection/Response:

- Brainstorm positive alternatives which would treat garbage as a resource as in *Charlotte's Web*. Have students make a list of the items that they would commonly throw away with an alternative method of use for each item.
- Have students write and/or illustrate their own ending to Stuart's story.

Extension:

- Read *Throwing Things Away* by Lawrence Pringle. Discuss how the improper management of garbage can be harmful to various animals, e.g., polar bears, seagulls, raccoons, etc. (Also taught in the lesson "Litter Hunt").

Common Curriculum Goal:

English: Reading

- Demonstrate evaluative comprehension of a variety of printed materials

Social Science: Social Science Analysis

- Identify, analyze, and select a course of action to resolve an issue.

Grade 3 Benchmark:

- Analyze and evaluate information and form conclusions.
  Students will draw conclusions about:
  1. author's motivation or purpose.
  2. probable reasons for actions or beliefs.
  3. whether identified portions of the passage are facts or opinions.
- Identify possible options or responses, then make a choice or express an opinion.

Reading Excerpts: From *Stuart Little* and *Charlotte's Web*

Stuart Little is a story about a mouse who lives in the city and is always getting into trouble. One day Stuart accidentally gets caught in a city garbage truck, here's the story...

The men threw the can with a loud bump into the truck, where another man grabbed it, turned it upside down, and shook everything out. Stuart landed on his head, buried two feet deep in wet slippery garbage. All around him was garbage, smelling strong. Under him, over, on all four sides of him--garbage. Just an enormous world of garbage and trash and smell. It was a messy spot to be in. He had egg on his trousers, butter on his cap, gravy on his shirt, orange pulp in his ear, and banana peel wrapped around his waist.

Still hanging onto his skates, Stuart tried to make his way up to the surface of the garbage, but the footing was bad. He climbed a pile of coffee grounds, but near the top, the grounds gave way under him and he slid down and landed in a pool of leftover rice pudding. "I bet I'm going to be sick to my stomach before I get out of this," said Stuart.

Why didn't Stuart like the garbage? Explain that even though Stuart didn't like the trash, some types of things like bugs, worms, and bacteria (germs) thrive in the trash and love to live there! Let's hear a portion of the story of *Charlotte's Web* to see how Wilbur the Pig feels about trash.

Lurvey [the farmer] dragged Wilbur's trough across the yard and kicked some dirt into the rat's nest, burying the broken egg and all Templeton's other possessions. Then he picked up the pail. Wilbur stood in the trough, drooling with hunger. Lurvey poured. The slops ran creamily down around the pig's eyes and ears. Wilbur grunted. He gulped and sucked and gulped, making swishing and swooshing noises, anxious to get everything at once. It was a delicious meal--skim milk, wheat middlings, left over pancakes, half a doughnut, the rind of a summer squash, two pieces of stale toast, a third of a gingersnap, a fish tail, one orange peel, several noodles from a noodle soup, the scum off a cup of cocoa, an ancient jelly roll, a strip of paper from the lining of the garbage pail, and a spoonful of raspberry jello.

Does Wilbur feel the same way about the trash as Stuart? Why not? Explain that for Wilbur this was not trash, but a useful resource (his dinner!). What are some of the things that we put into the trash that can still be a resource?
Examples: fixing broken toys, or appliances at home; repairing or giving away clothing; building small art projects like a birdhouse or a sculpture out of unwanted items; making compost from food or yard waste that we put back into our garden.

Bring the students back to *Stuart Little*, let's find out what happens to him:

There was no way for him to get out of the truck, the sides were too high. He just had to wait. When the truck arrived at the East River, the driver drove out onto the pier, backed up to a garbage scow, and dumped his load. Stuart went crashing and slithering along with everything else and hit his head so hard he fainted and lay quite still, as though dead. He lay that way for almost an hour, and when he recovered his senses, he looked about him and saw nothing but water.

The scow was being towed out to sea. "Well," thought Stuart, "this is about the worst thing that could happen to anybody. I guess this will be my last ride in this world." For he knew that the garbage would be towed twenty miles out and dumped into the Atlantic Ocean."

Where will Stuart and the garbage end up if it gets dumped into the ocean? Discuss the probable effects on the wildlife--possible pollution from chemicals in the garbage, sea life eating things that are indigestible such as plastic, garbage that cannot sink will end up back on the beaches as litter, etc.

Explain to the class that ocean dumping is not a principle practice for waste disposal in the United States any longer. **We now bury or burn our garbage, but there are negative impacts associated with these forms of disposal as well. Do you see why it is important to think about trash before we create it?**

Lesson: A Lot Of Garbage

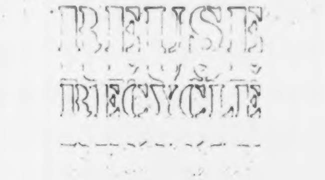
Grade: 1-3
Subject: Science, Math
Objectives:

- define and give examples of waste
- identify the amounts of solid waste produced by individuals and groups

Teaching Time: 10 minutes introduction; return to lesson at the end of the day or the following day about 45 minutes if you do calculations with the class.

Materials: 1 trash bag per student; large plastic or paper tarp; bathroom scale; gloves transparency, What's in Our Garbage?; student worksheet, If Bagging Trash is Your Game; class worksheet, Garbage Audit

(Optional:) a five gallon bucket to estimate volumes of the materials sorted.



Background

If students are going to help solve the garbage (waste) problem, they first need to understand the size of the problem. Throwing away a single gum wrapper or banana peel doesn't seem very important, until we see the cumulative impact of everyone's combined trash over a period of time. By performing a classroom or school wide waste audit, students will gain the necessary perspective to realize that everyone's individual waste contributes to solid waste management problems.

In this exercise, students will collect their own personal garbage for an entire day. Another option for this lesson is to assign your class as a team to collect representative samples from the school's waste bins. By performing a school waste audit, you can qualify to become an Oregon Green School. For details visit the Oregon Green School web site at www.oregongreenschools.org. Read about the Oregon Green Schools Association in the Teacher Resource Section. You may also want to use Oregon Green Schools Tools as a resource for this lesson available at www.deq.state.or.us/wmc/solwaste/edu.html.

Procedure:

INTRODUCTION

- **Who can tell me what garbage is? What is waste? Waste is material thrown away because it is worn out, used up, or no longer needed. What are some synonyms for the word garbage?** (Waste, trash, refuse, rubbish).
- **Can anyone tell me some examples of waste? (List the responses on the board.) Waste could also be thought of as things for which we have not yet found a use.** Note: One person's trash is another person's treasure!
- **Let's see what kind of waste we make. Today you will be putting all of your garbage in your own personal trash bag. We will NOT be using the class garbage can (or recycling box). Remember, all of your waste goes in your bag.** Hand out a bag to each student. You may wish to cover the classroom garbage can and recycling box. You might tell students to collect DRY materials only, or use a separate plastic bay for food scraps. CAUTION: NO SHARP ITEMS OR BATHROOM WASTE.

END OF or FOLLOWING DAY (Optional: You may also wish to have students carry their bags home to add trash they generate at home until the end of the day and bring the bags back to school for auditing).

- **Let's look inside of our garbage bags and see what we have.** Get examples from students of what they have thrown away.
- Individually or as an entire class, sort and tally the number of pieces of garbage. Use the Garbage Audit Sheet for this activity.
- **What do you notice from doing the tally?** Students should notice how much garbage is thrown away at home and at school, and what types of things are thrown away.

- **How much do you think your trash weighs?** Weigh the individual bags or dump the trash on a tarp, pull it together and weigh it as one pile. **How much would a week's supply of garbage weigh? What about a year?** Do calculations for the students to find the answers!
- Show transparency, "What's in Our Garbage?". You might like to fill in the actual percentages for older students. **How does our garbage compare to what all of Oregon throws away?** Use the statistics for the state listed at the end of this lesson to compare with your class or school results.

Reflection/Response:

- **What could you do to make less waste?** (Examples include never taking more than you need, finding creative uses for items that are no longer wanted by others, giving away clothes that no longer fit to someone else, etc.)
- Make a list of items like a glass jar, paper that is only used on one side, an old piece of clothing or piece of fabric, etc. and have children work together to come up with ideas for reusing the item before it has to be recycled or thrown away.
- Have older students make a graph of the amount and types of waste generated.
- Assign the worksheet "If Bagging Trash is Your Game".

Extensions:

- Extend waste collection time and post results for a week or month--or simply extrapolate the numbers. Complete the weighing activity at the end of each day.
- Repeat this lesson after you complete several other lessons in this book. See if students are able to reduce the amount of waste generating by trying the suggestions they learn about reducing, reusing, and recycling.
- Have older students make a comparison graph of their waste generated before being taught the lessons and after several lessons about waste prevention and recycling have been taught.

Common Curriculum Goal:

Mathematics: Statistics and Probability

- Interpretation of Data
- Read, construct, and interpret displays of data (e.g., charts, tables, graphs) using appropriate techniques and technologies.

Science: Unifying Concepts and Processes

- Apply foundation concepts of change, cycle, cause and effect, energy and matter, evolution, perception, and fundamental entities.

Grade 3 Benchmark

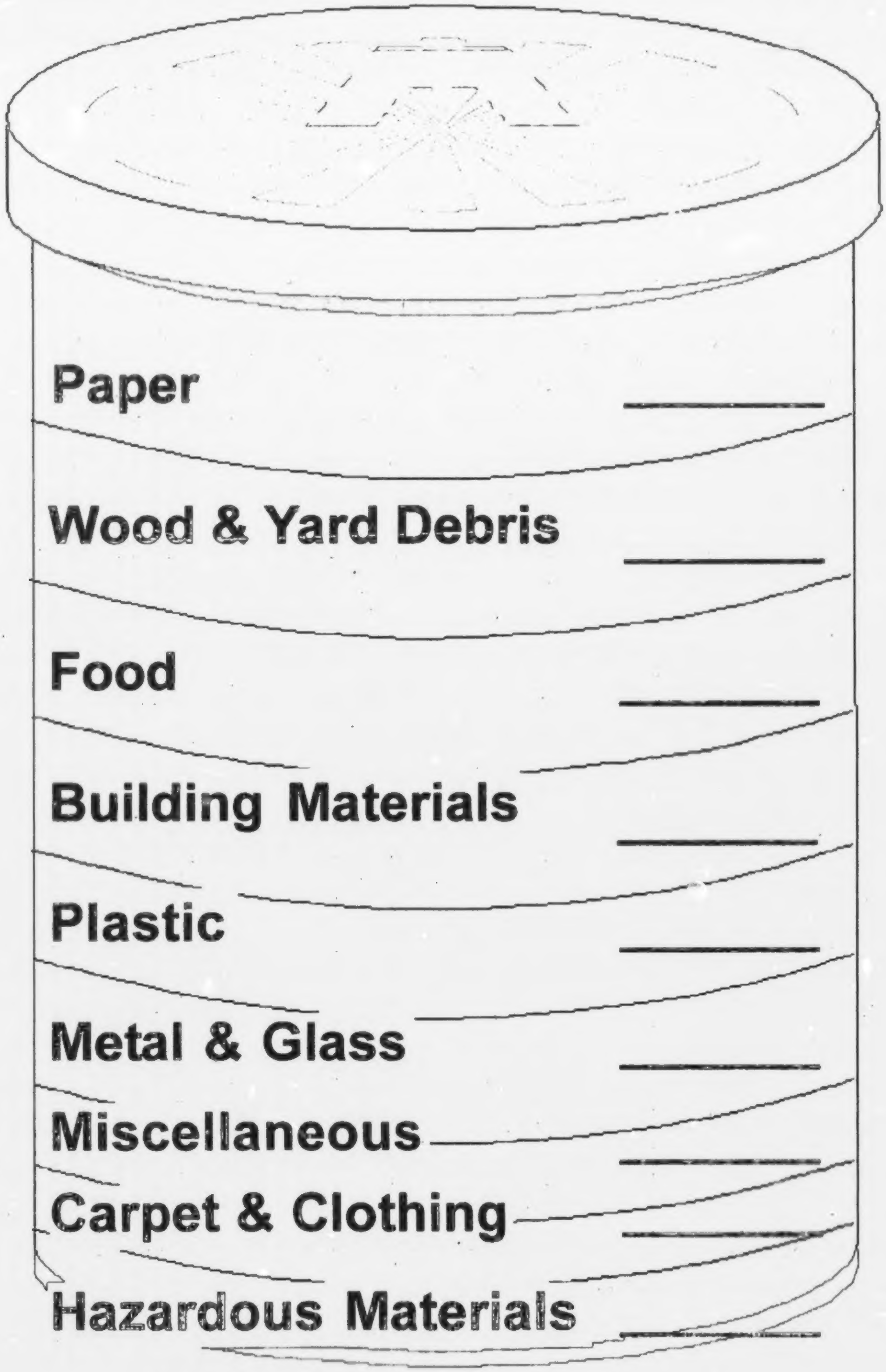
- Collect, organize, display, and describe simple data using charts, tables, number lines, bar graphs, and line graphs.
- Identify examples of change. Arrange parts of a cycle.

1999 Data from the Oregon Department of Environmental Quality on Waste Composition:

Paper	24%
Wood and Yard Debris	16%
Food Waste	14%
Metal and Glass	10%
Plastics	10%
Building Materials	10%
Miscellaneous	9%
Carpet and Clothing	6%
Hazardous Waste	1%

To find updated statistics visit the Solid Waste website: http://www.deq.state.or.us/wmc/solwaste/rsw.htm or contact the Solid Waste Education staff at 800-452-4011 or 503 229-5913.

Overhead: What's In Our Garbage?



Paper ________

Wood & Yard Debris ________

Food ________

Building Materials ________

Plastic ________

Metal & Glass ________

Miscellaneous ________

Carpet & Clothing ________

Hazardous Materials ________

Worksheet: If Bagging Trash Is Your Game

If Bagging Trash is Your Game, this Match is for you.
Match each word on the left with the phrase that best describes it.

Trash _____
Litter _____
Reuse _____
Natural Resources _____
Landfill _____
Recycling _____
Aluminum & Tin _____
Paper _____
Reduce _____
Compost _____
Pollution _____

A. To find a new use for something instead of throwing it away.
B. A recyclable material made from trees.
C. To buy less and to throw away less trash.
D. Leaves and grass clippings that are broken down by natural forces and can be used on gardens.
E. Our garbage, all the things we throw away.
F. Trash that is in the wrong place, such as on the ground or in the street.
G. Damage to the environment from chemicals or other human activities.
H. Metals that are made from minerals in the ground.
I. A special place in the ground where trash is buried.
J. Things that are found in nature such as air, water, trees, minerals that we use to make energy and to help us make other things.
K. A process that makes something new out of something old.

Source: South Carolina Department of Health and Environmental Control: *Action for a Cleaner Tomorrow* (1996)

Teacher Worksheet: Garbage Audit

Area of Audit (check one)

☐ Classroom ☐ Staff Room or Office ☐ Cafeteria ☐ Kitchen ☐ Other________

Name or Class or School____

Students should appreciate that individual garbage may be only a small amount. However, this garbage must be combined and total weights and volumes will be recorded so that you may calculate daily/weekly/monthly/yearly amounts for your class, your school or per person.

Instructions:Combine all individual bags into one large bag. If you are auditing a large area, weigh each container for the area.

Total weight of garbage including container or person's body weight __________lb.

Subtract the weight of the empty container or person's weight __________lb.

Total weight of garbage __________lb.

Total volume of the garbage __________gal.
(estimate based on the fullness of the bag or container)

Total weight of the garbage that is recyclable __________lb.

Waste Composition--What's in the Can?

(To do an in depth audit, you will need to classify materials into types under each category. For example, Paper: writing, brown bags, cardboard, etc.)

Material Type	**Weight**		**Number of Items**	**Volume**	
	Pounds	**%Total**		**Gallons**	**%Total**
Paper					
Plastic					
#1					
#2					
Other					
Metal					
Aluminum					
Other					
Glass					
Bottle Bill (deposit)					
Other					

Lesson: Where Is Away?

Grade: K-3
Subject: English
Objectives:
Students will:

- recognize that there is no "away" in "throw it away"
- identify the destination of the waste they generate at home and at school
- identify the negative aspects of dumping or burning trash
- learn the "solid waste hierarchy" for best management of our trash

Teaching Time: 40 minutes

Materials: Read: "Sarah Cynthia Sylvia Stout" from *Where the Sidewalk Ends* by Shel Silverstein transparencies, Where Trash Goes and Oregon Waste Hierarchy; worksheets, Landfill! and Mining the Landill

REDUCE
REUSE
RECYCLE

Background:

Garbage, also called solid waste, is generated by people at home, at work, on vacation--well, everywhere! Most garbage is generated by businesses during the manufacture, processing and shipping of products. Although the exact percentage of business waste in Oregon is hard to calculate, it is estimated to be about 60%. In 1999, Oregon disposed of 2.8 million tons of garbage. This is equivalent to 4.6 pounds of waste per person per day. Of this total, 92% was disposed of in sanitary landfills; the remainder was disposed of by incineration in Marion and Coos Counties* (these incinerators monitor burning with computerized pollution control devices to protect air quality).

An unknown amount of garbage is disposed by people illegally dumping their garbage in rural or abandoned areas and by burning their garbage in their fireplaces or on their property. Illegal dumping is punishable by a fine. The practice of burning or burning certain types of materials is illegal in some areas. (See the Burning Factsheet in the Teacher Resource section for more information). DEQ discourages burning anywhere because of certain hazards it poses. Burning is hazardous because it releases dangerous chemicals and metals into the air, often releases unpleasant odors into the neighborhood or community, but most importantly, burning poses serious health threats to people breathing the fumes.

Certain types of materials are banned from Oregon landfills and should not be placed in your garbage. (See the Landfill Bans Factsheet in the Teacher Resource section for more information). Hazardous or toxic materials that come from people's homes are discouraged from being placed in the garbage because they can injure solid waste workers and cause serious threats to the environment. Improper handling and disposal of hazardous substances can result in the release of "persistent bioaccumulative toxins" (PBTs) such as polychlorinated biphenyls (PCBs), mercury, and many pesticides, herbicides, and insecticides. Most PBTs are known or probable human carcinogens. The best way to deal with potentially hazardous substances is to use safer alternatives and use all of the product as it was intended, whenever possible. The following is a list of materials that should be disposed of at hazardous waste facilities or community special collection events whenever possible:

- pesticides, weed killer, moth balls, flea killers, herbicides
- pool/spa chemicals
- batteries--lead acid or nickel-cadmium types (contain acids and heavy metals)
- electrical equipment containing polychlorinated biphenyls (PCBs) such as older televisions, refrigerators, hydraulic fluid, or coolant liquids
- paints/solvents
- products containing mercury such as thermometers, thermostats, fluorescent light tubes
- harsh chemical cleaners such as bleach, oven cleaner, drain cleaner
- materials that are flammable, reactive, corrosive or toxic

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*As we go to press Coos Bay Incinerator is still operating. However, it may close in the near future because of other solid waste management options that have become available to the area and that may be more cost effective.

Contact your local city or county Solid Waste or Public Works Department to find out how to properly dispose of potentially dangerous items in your area or call the Household Hazardous Waste Hotline 800-732-9253. (To follow up in more detail on hazardous items use the lessons in the Hazardous Waste section.) To learn more about priority PBTs go to: http://www.epa.gov/pbt/cheminfo.htm.

Fortunately, Oregonians are being educated to reduce, reuse and recycle as much material as possible. In 1999, Oregonians recovered 37% of the total waste generated. Of these recovered materials, 66% was recycled, 19% was burned for fuel, and 15% was composted.

Procedure:

- Read and discuss the poem, "Sarah Cynthia Sylvia Stout" by Shel Silverstein.
- **What do you think happened to Sylvia Stout? Why is it important to take the garbage out? Once it is out, where does it go--Where exactly is "Away"?**
- **How do you think trash is disposed?** Tell them in Oregon, trash is usually landfilled and a small amount is burned at special factories or plants.
- **Is it okay to dump your garbage out in open areas, ditches, ravines or forests? NO! Why not?** Students should conclude reasons like: it looks ugly, it can pollute the environment, or hurt animals or people that might come in contact with the garbage.
- **Does anyone's family burn garbage at home?** Explain to the children that fumes and gasses coming from a trash fire is unhealthy. **Fumes can hurt your eyes and your lungs. Especially fumes from burning plastics--never, ever burn plastics!**
- **Never get close to the fire or breathe the smoke!** Point out that some chemicals cannot be seen or smelled, so it is not always obvious when something is harmful. Also, let them know that they should never set things on fire because it is bad for the air and for people and animals who breathe the polluted air.
- Show and discuss transparency, "Where Trash Goes."
- **What might happen if the landfill gets filled up? Where would we put the trash? Finding new land to build a new landfill is very expensive and difficult. And no matter how careful we are, sometimes landfills still cause pollution after many years, so we need to keep using the ones we have as long as we can.**
- Discuss with students what they might do to create less waste. Students should mention things like: not taking or using more items than you need (like paper in class or napkins in the cafeteria), returning soda cans and bottles for deposits, recycling newspaper and plastic, repairing broken objects instead of buying new ones, giving used clothes to others, etc.

- Show the transparency "Oregon Waste Hierarchy." Oregon has a "waste hierarchy" for lessening the flow of waste to landfills. Teach students about "The 3 R's" (Reduce, Reuse, Recycle). We want people to Reduce first, Reuse everything you can, Recycle what is possible, then properly dispose of waste as a final option!

Reflection/Response:

- What would happen if the garbage truck stopped coming? Have younger students illustrate a story. Older students might write an imaginative essay about such a story.
- Have students complete the worksheet, "Landfill!" and "Mining the Landfill."

Extension:

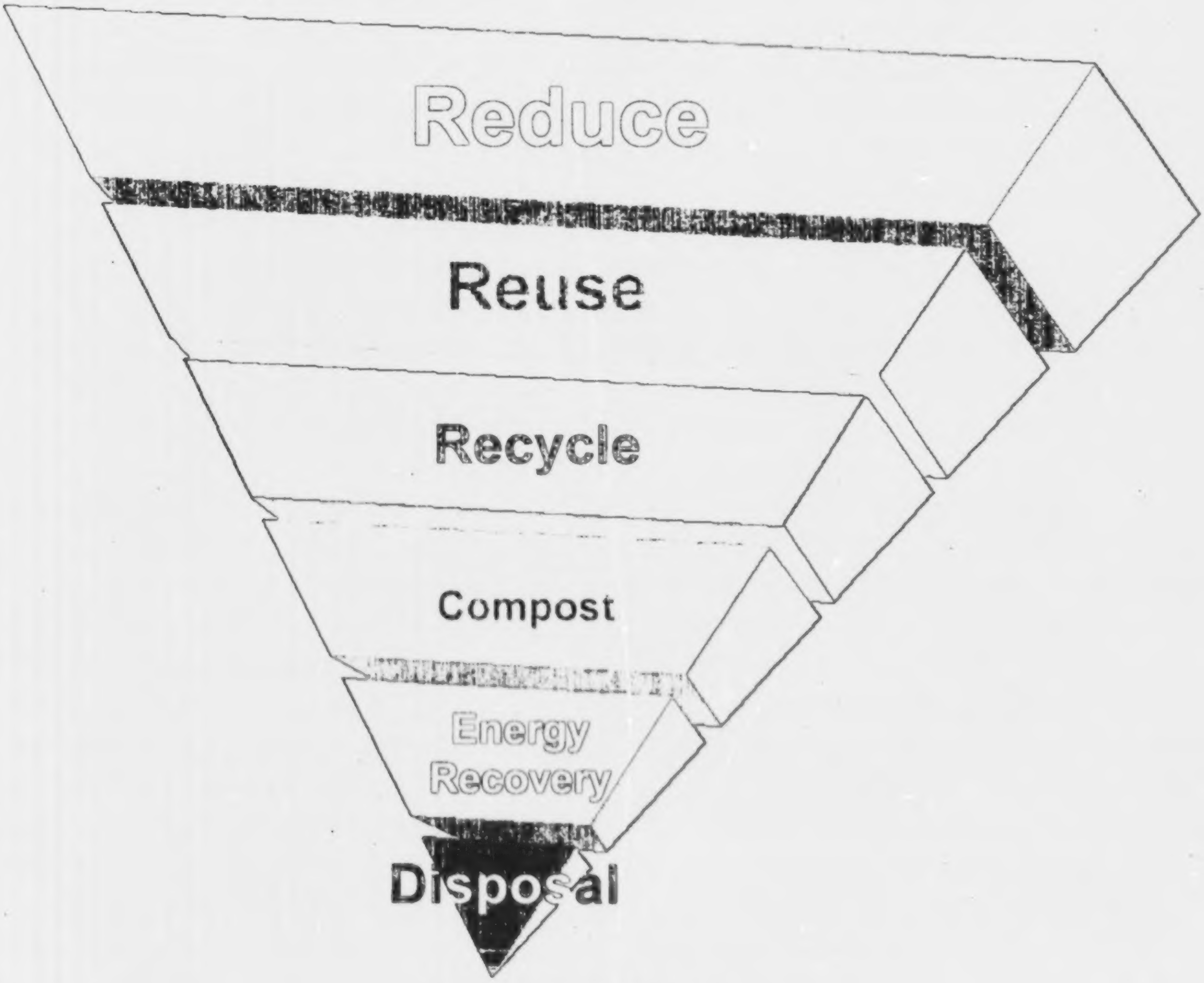
- Invite the school custodian to class and ask about his or her trash removing duties.
- Visit a landfill. (See the Field Trip Guide for possible trips in your area).
- Go on a virtual field trip to the Coffin Butte landfill in Oregon on the Internet by visiting their website at http://www.cof.orst.edu/cof/teach/for365/tours/lf_tour/.
- Have students design a motivational poster for the classroom illustrating the Oregon Waste Hierarchy using their own concepts. (See Lesson: Where is Away).

Common Curriculum Goal:
English: Reading and Writing
- Demonstrate inferential comprehension of a variety of printed materials.
- Use a variety of modes (e.g., narrative, imaginative, expository, persuasive) in appropriate context.

Grade 3 Benchmark:
- Identify cause and effect relationships and make simple predictions.
- Write in a variety of modes (e.g., narrative, imaginative, expository, persuasive).

An example of modern society's growing trash problem.

Overhead: The Oregon Waste Hierarchy

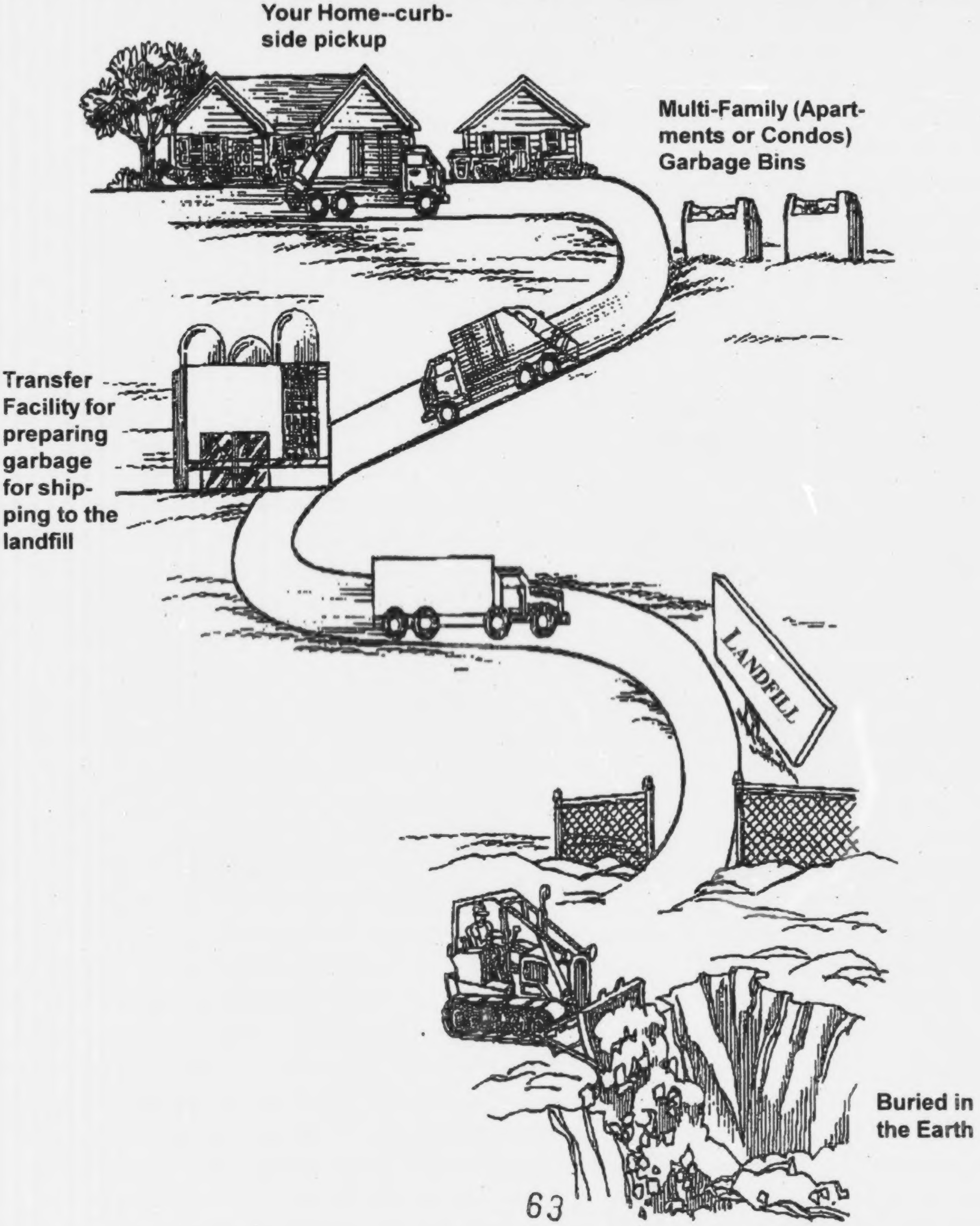

Reduce
Reuse
Recycle
Compost
Energy Recovery
Disposal

How the Trash Pile Grows

Written by Betty Miles, *Save the Earth Ecology Handbook for Kids,* 1974.
Borrowed with permission from *A Way with Waste*, Washington Department of Ecology (1990).

Buy it, try it, throw the trash away!
Take it, break it, throw the trash away!
Get it, use it, finish it , lose it.
Wear it, tear it, throw the trash away!
Soda pop, box top, once you start you can't stop.
Buy it, show it, nothing left but to throw it!
Throw the trash away!
(Oh, no—where is "away"?)

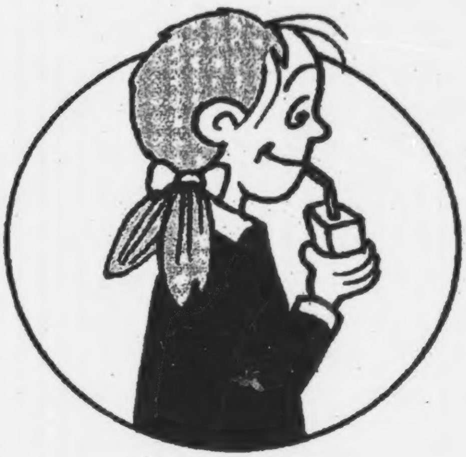
Overhead: Where Trash Goes

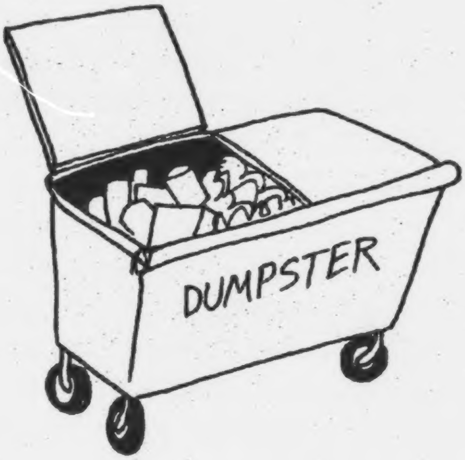

Your Home--curb-side pickup
Multi-Family (Apartments or Condos) Garbage Bins
Transfer Facility for preparing garbage for shipping to the landfill
LANDFILL
Buried in the Earth

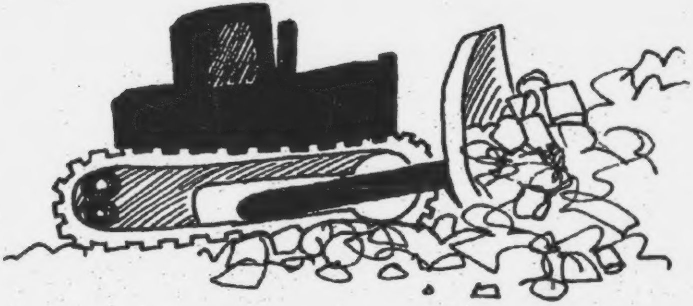
Source: South Carolina Department of Health and Environmental Control: *Action for a Cleaner Tomorrow* (1996)

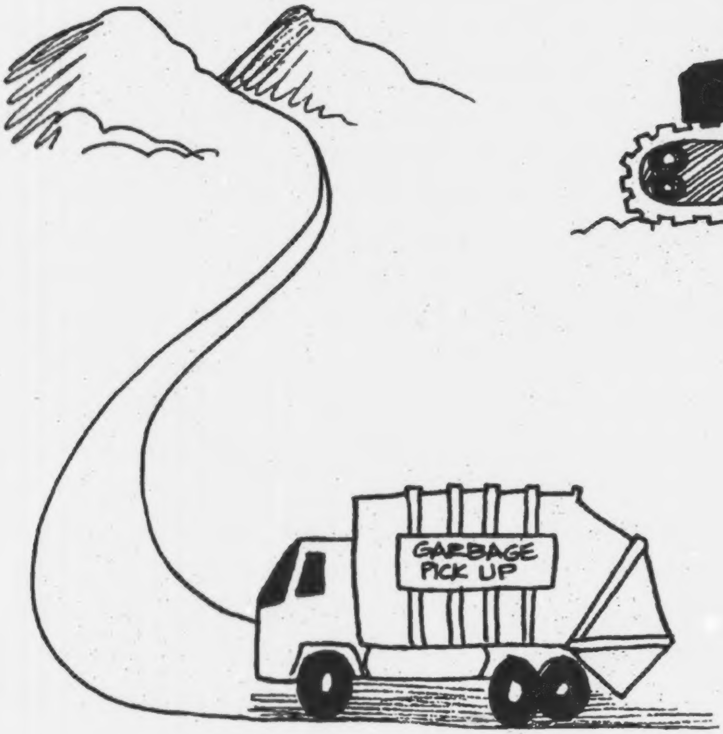
Worksheet: Landfill!

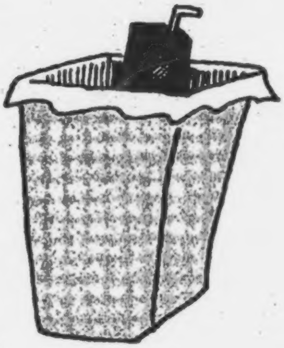
Draw arrows to show each step from first, throwing a juice box away to finally, the juice box going into a landfill. Number and label each of the steps from first to last to show what is happening.











Source: Minnesota Office of Environmental Assistance: *Whata Waste K-6 Waste Management Education Curriculum*

Worksheet: Mining the Landfill

Help! Some very valuable things are on their way to the landfill.

Save them from being thrown away. Circle in blue, the things that can be recycled. Circle in green, things you could reuse. Some items may be both! Be sure to look for:

- newspaper
- crayons
- margarine tub
- brush
- tin cans
- bottles
- blank paper
- motor oil
- plastic bag
- grocery bags
- old toys
- aluminum
- cardboard
- pencils
- box
- plates
- jars
- milk jugs
- art paper
- sock

Can you find some bonus words too? What do they tell you?____________________________

____

S	O	C	K	Y	A	R	E	D	U	C	E	L	M	N	O	P
V	W	X	Y	Z	L	X	R	E	P	A	P	K	N	A	L	B
G	H	I	T	B	U	T	E	N	I	R	A	G	R	A	M	J
F	T	X	I	P	M	I	L	K	J	U	G	S	S	Q	R	S
L	P	E	N	C	I	L	S	C	O	L	D	T	O	Y	S	A
U	N	E	C	V	N	R	E	U	S	E	I	C	X	M	D	X
N	I	T	A	M	U	S	A	V	E	C	R	A	Y	O	N	S
C	E	B	N	C	M	A	B	C	B	N	Q	R	S	T	E	R
H	O	W	S	U	X	P	Q	A	T	O	M	D	R	O	G	E
B	A	R	S	Z	P	Y	G	B	S	I	X	B	L	R	A	C
A	R	E	L	P	L	R	M	R	O	T	B	O	X	O	B	Y
G	T	U	Z	J	A	R	S	U	P	U	O	A	K	I	R	C
S	P	S	K	R	T	P	K	S	M	L	T	R	D	L	A	L
F	A	E	L	M	E	P	E	H	O	L	T	D	M	L	G	E
R	P	X	Y	Z	S	O	P	R	C	O	L	D	O	N	T	M
O	E	C	Y	T	N	E	V	E	R	P	E	W	A	S	T	E
G	R	O	C	E	R	Y	B	A	G	S	S	E	R	O	X	J

Source: South Carolina Department of Health and Environmental Control: *Action for a Cleaner Tomorrow* (1996)

Teacher's Key: Mining the Landfill

Help! Some very valuable things are on their way to the landfill.

Save them from being thrown away. Circle in blue, the things that can be recycled. Circle in green, things you could reuse. Some items may be both! Be sure to look for:

newspaper
crayons
margarine tub
brush

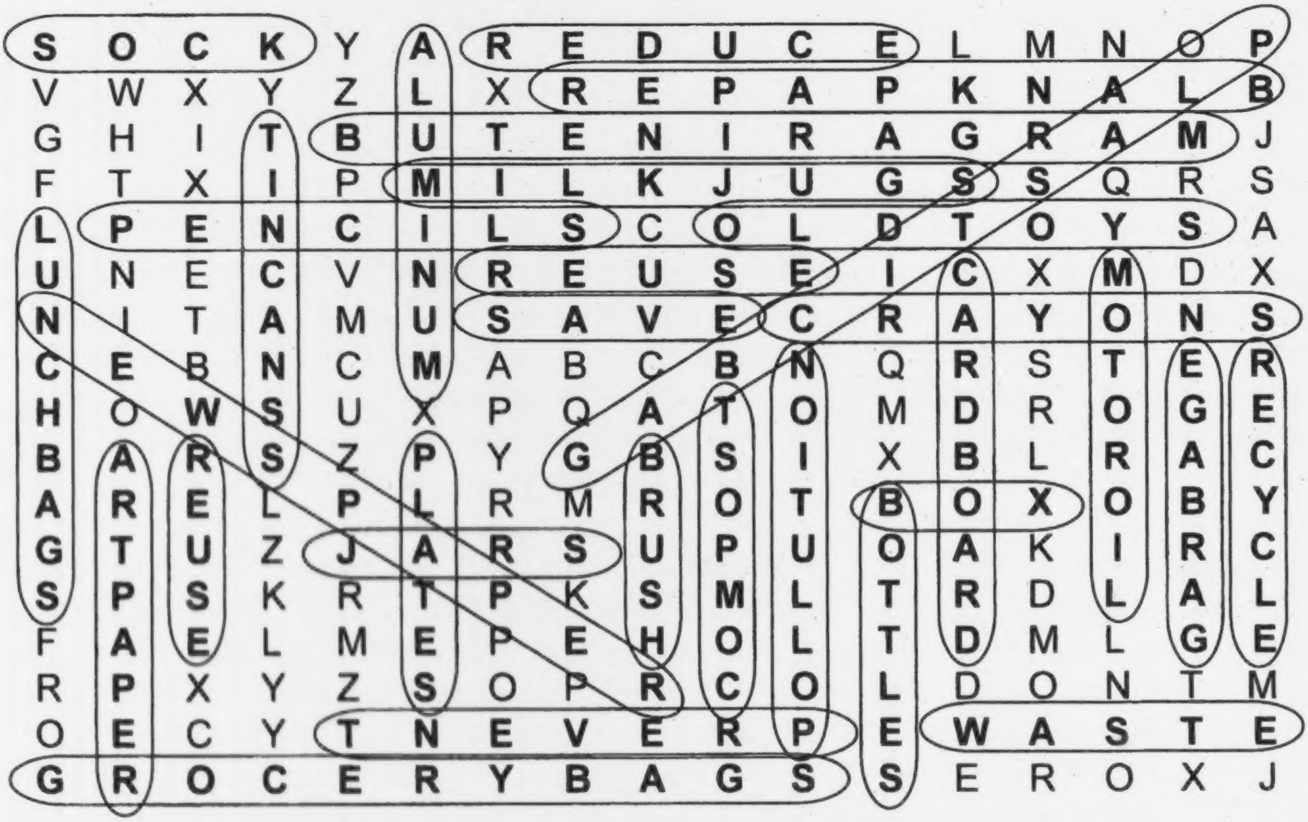
tin cans
bottles
blank paper
motor oil

plastic bag
grocery bags
old toys
aluminum

cardboard
pencils
box
plates

jars
milk jugs
art paper
sock

Can you find some bonus words too? What do they tell you? COMPOST GARBAGE, REDUCE, REUSE, RECYCLE, PREVENT WASTE & POLLUTION, SAVE LUNCHBAGS



S	O	C	K	Y	A	R	E	D	U	C	E	L	M	N	O	P
V	W	X	Y	Z	L	X	R	E	P	A	P	K	N	A	L	B
G	H	I	T	B	U	T	E	N	I	R	A	G	R	A	M	J
F	T	X	I	P	M	I	L	K	J	U	G	S	S	Q	R	S
L	P	E	N	C	I	L	S	C	O	L	D	T	O	Y	S	A
U	N	E	C	V	N	R	E	U	S	E	I	C	X	M	D	X
N	I	T	A	M	U	S	A	V	E	C	R	A	Y	O	N	S
C	E	B	N	C	M	A	B	C	B	N	Q	R	S	T	E	R
H	O	W	S	U	X	P	Q	A	T	O	M	D	R	O	G	E
B	A	R	S	Z	P	Y	G	B	S	I	X	B	L	R	A	C
A	R	E	L	P	L	R	M	R	O	T	B	O	X	O	B	Y
G	T	U	Z	J	A	R	S	U	P	U	O	A	K	I	R	C
S	P	S	K	R	T	P	K	S	M	L	T	R	D	L	A	L
F	A	E	L	M	E	P	E	H	O	L	T	D	M	L	G	E
R	P	X	Y	Z	S	O	P	R	C	O	L	D	O	N	T	M
O	E	C	Y	T	N	E	V	E	R	P	E	W	A	S	T	E
G	R	O	C	E	R	Y	B	A	G	S	S	E	R	O	X	J

Lesson: Look At A Landfill

Grade: K-3

Subject: Science, Social Sciences

Objective:

Student will:

- identify landfills as the most common method of disposing solid waste
- describe the form and function of a sanitary landfill by observing a model
- understand that waste does not "go away" or decompose when it is placed in a landfill in comparison to a natural cycle
- discuss how landfills take up space and are located in areas that are, or were, habitats for people and wildlife

Teaching Time: 45-60 minutes

Materials: a prepared one-gallon milk jug (or more if you would like students to work in small groups to construct their own); six cups of garden soil (not potting soil); grass, leaves, sticks, small plastic animals; a few Ziploc bags for plastic lining; blue construction paper; transparency Landfill in a Jug Diagram; A Simple Diagram of A Landfill and When Will These Things (Continued)

REDUCE
REUSE
RECYCLE

Background:

(Prerequisite: Cycles in Nature). Almost all garbage is eventually disposed of in a landfill. (See "Where Is Away?" Background for more detail). As of 2001, there are 36 active municipal solid waste landfills in Oregon. Some, but not all, of these landfills have upgraded modern systems that maximize environmental protection. "Modern" landfills (all landfills or sections (called cells) of landfills built after 1991) are called sanitary landfills because they are lined with a thick plastic and clay layers and have leak monitoring systems in order to protect our groundwater. Older unlined landfills continue to be a source of environmental pollution that we must pay to clean up until they no longer exist.

According to federal law, all closed landfills must be monitored for 30 years. Landfills are monitored for two reasons. First, to control methane buildup which can cause fires and explosions and second, to control "leachate" which can leak out. With regard to the first issue, the technology has now developed so that we can "harvest" the excess methane from large landfills and actually use it as a source of energy. However, this is still not a very efficient process and is still not being widely used, but it may be important for future energy conservation efforts.

The second issue, controlling leachate, is difficult and complex. Leachate is any liquid that comes into contact with garbage and commonly contains undesirable components such as volatile organic compounds (VOCs), nitrates, trace metals, and other salt compounds. Additionally, the pH of leachate is usually corrosive, so when it migrates through the soil it can remove naturally occurring iron and manganese which can pollute surface and groundwater.

Leachate is dealt with by two primary approaches. The first approach to dealing with the problem of leachate is to keep the landfill as protected and dry as possible so that excess leachate is not formed. In Oregon this is how it is handled. This means that garbage is not receiving much air or water and will not break down for an unknown period of time. Modern landfills with leachate monitoring systems will test the leachate for presence of hazardous constituents. If the leachate is not hazardous, it is removed and sent to the waste water treatment facility. Hazardous leachate is processed the same as any other hazardous waste.

The second method for dealing with leachate is being tried in other parts of the U.S. This method involves the "recirculation" of the leachate and air through the landfill in order to speed up the decomposition of garbage. This method tries to deal with any problems stemming from the decomposition such as toxins or methane right away while the landfill is still open and being actively monitored. There are critics of both methods for dealing with landfilled waste and the "best" method has not been agreed upon.

Procedure:

- **Where does trash go when we throw it away?** Most trash (92%) in Oregon goes to landfills, a small amount gets burned by incinerators.
- **Today we are going to build a model of a landfill much like those used in Oregon for storing solid waste.**
- Using the needed materials and the diagram of a landfill in a jug, follow these steps:

(Option: Have groups construct models along with you.)

1. See instruction sheet for making a landfill in a jug. **What does the blue paper (or other material you picked) on the bottom represent? Water under the ground. People pump this water through wells and use it to drink and farmers use it to water their crops. Garbage should not touch or leak onto the blue paper.**
2. Dig a hole for a landfill in the soil of the gallon jug. **What could be done with the soil that is dug up? It will be used later to cover up the disposed trash.**
3. Show the transparency, "A Simple Diagram of a Landfill." Point out the lining of the landfill. **Thick plastic liners are used on the bottom of landfills in order to prevent garbage from leaking in the ground water.** (Use a piece from a Ziploc bag, plastic film or a grocery bag).
4. After placing the plastic liner in the landfill, add about six or seven pieces (about one-half to one inch in size) of garbage and/or allow students to find something in the classroom that they could put in their landfills. Examples are: a piece of crayon, part of a snack/lunch, a leaf, a piece of paper, or a tissue.
5. Pack down the garbage, as compactors do at a real landfill. Cover the garbage layer with soil. This simulates how the garbage at a landfill is covered daily with soil to eliminate odor and to keep animals, such as rats, out of the landfill.
6. Have students record a description of a landfill and draw a picture of the classroom model. Do some reflection and response on what will happen to the garbage in their model landfill. Discuss the ways in which the classroom model is similar to and different from a real landfill.

Decompose?; pieces of daily garbage

(Optional:) Build a larger classroom landfill model from an old aquarium.

Reflection/Response:

- **What can be done with our garbage now that our landfill is full?** Students might recommend using another landfill or digging a new one.
- **Will digging a new landfill cause any problems? Yes, it will impact the land and the plant and animal life in the area. And remember, landfills could possibly leak into groundwater.**
- **What could we do to keep the landfill from filling up so quickly?** Lead class to a discussion of reduction, reusing, and recycling. Teach students Oregon's "waste hierarchy" (The 3R's) Reduce, Reuse and Recycle! (See Overhead in Lesson: Where is Away?)
- **Are there any objects in the landfill that could be recycled or reused?**
- Create a list of the pros and cons of placing trash in the landfill. Write it on the board or have students make their own lists. Pros include: we need a place to put our trash; landfills are constructed to help protect the environment. Cons include: the plastic liner might eventually break and let pollution get into the groundwater; when the landfill gets full it is hard to find a good place to build a new one; things that are buried in the landfill are no longer able to be used by nature or by people.

- Show the transparency, "When Will These Things Decompose?" Note: the number of years refers to garbage decomposition when exposed to open air and sunlight, not when buried in a landfill! (Remind students about natural cycles).

Extensions:

- Ask students to write or illustrate their ideas for keeping garbage out of a landfill. Examples are to: give away my toys to others, compost food and yard debris at home, reduce the amount of disposable items that I use, repair things when I can, never take more than I need, etc.
- Ask students to illustrate garbage leaving their home and the route it passes as it goes to the landfill.
- Take students on a field trip to see their local landfill or transfer station (or incinerator if you are in Marion and Coos County). (See the Field Trip guide for your area).
- Ask the local waste hauler or solid waste coordinator to visit your class and explain where waste goes and what can be recycled.

Common Curriculum Goal:

Science: Unifying Concepts and Processes

- Apply explanatory concepts of model, system, theory, probability, and replication.

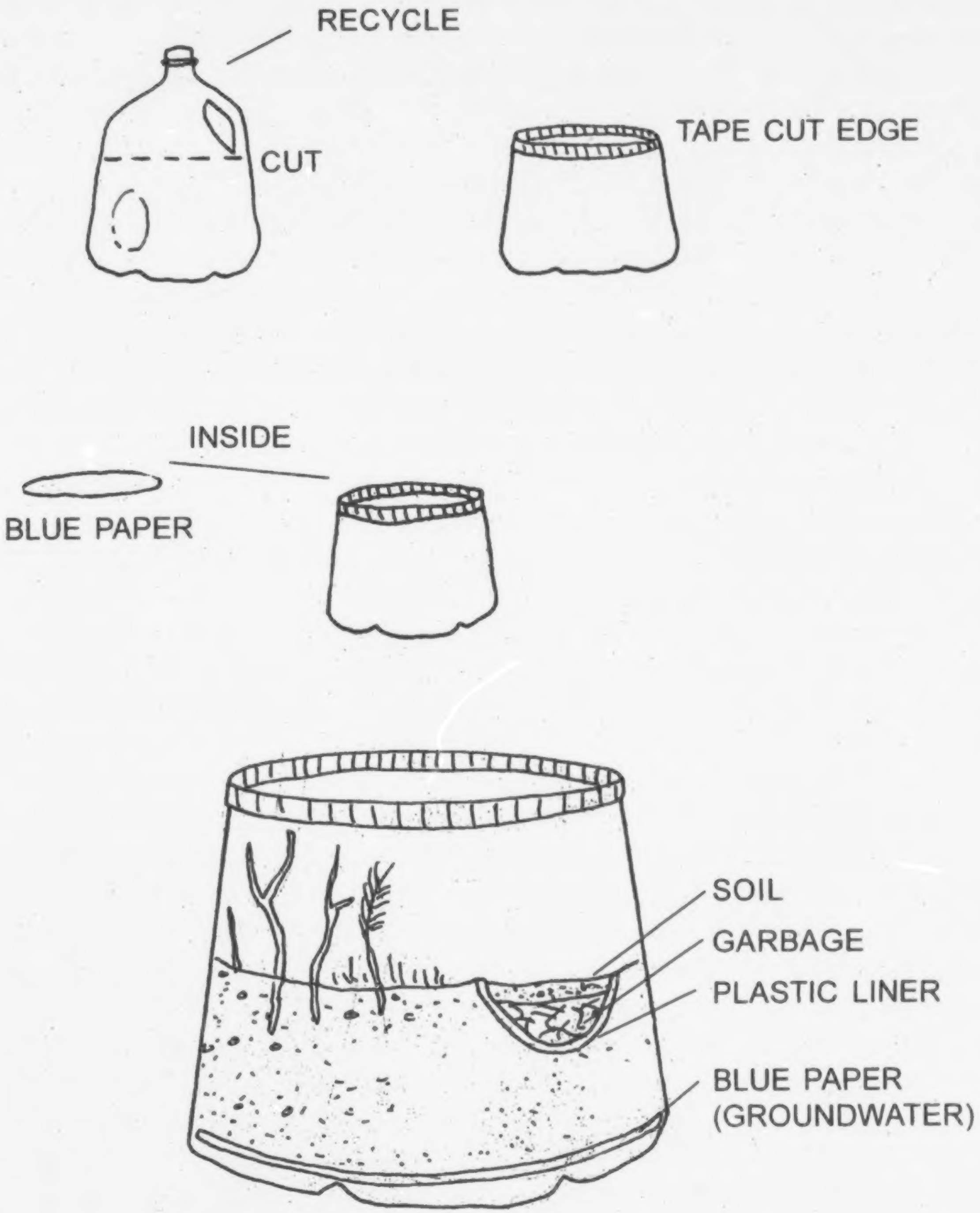
Social Science: Analysis

- Identify, analyze, and select a course of action to resolve an issue.

Grade 3 Benchmark:

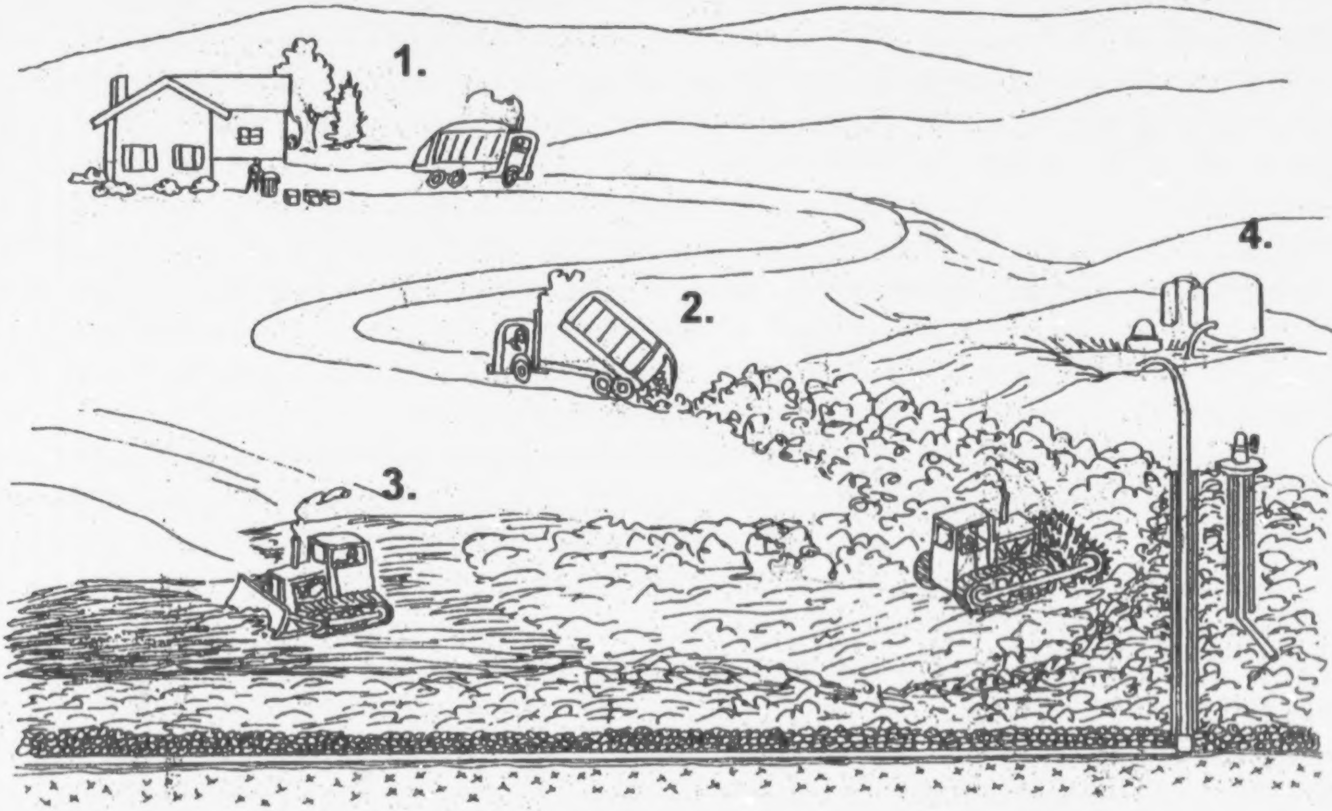
- Compare objects, drawings, and constructions to the real things they represent
- Identify how people or other living things might be affected by an event, issue, or problem.

Overhead: Landfill In A Jug Diagram


RECYCLE
CUT
TAPE CUT EDGE
INSIDE
BLUE PAPER
SOIL
GARBAGE
PLASTIC LINER
BLUE PAPER
(GROUNDWATER)

Source: California Integrated Waste Management Board: *Closing the Loop: Exploring Integrated Waste Management and Resource Conservation K-6* (2000)

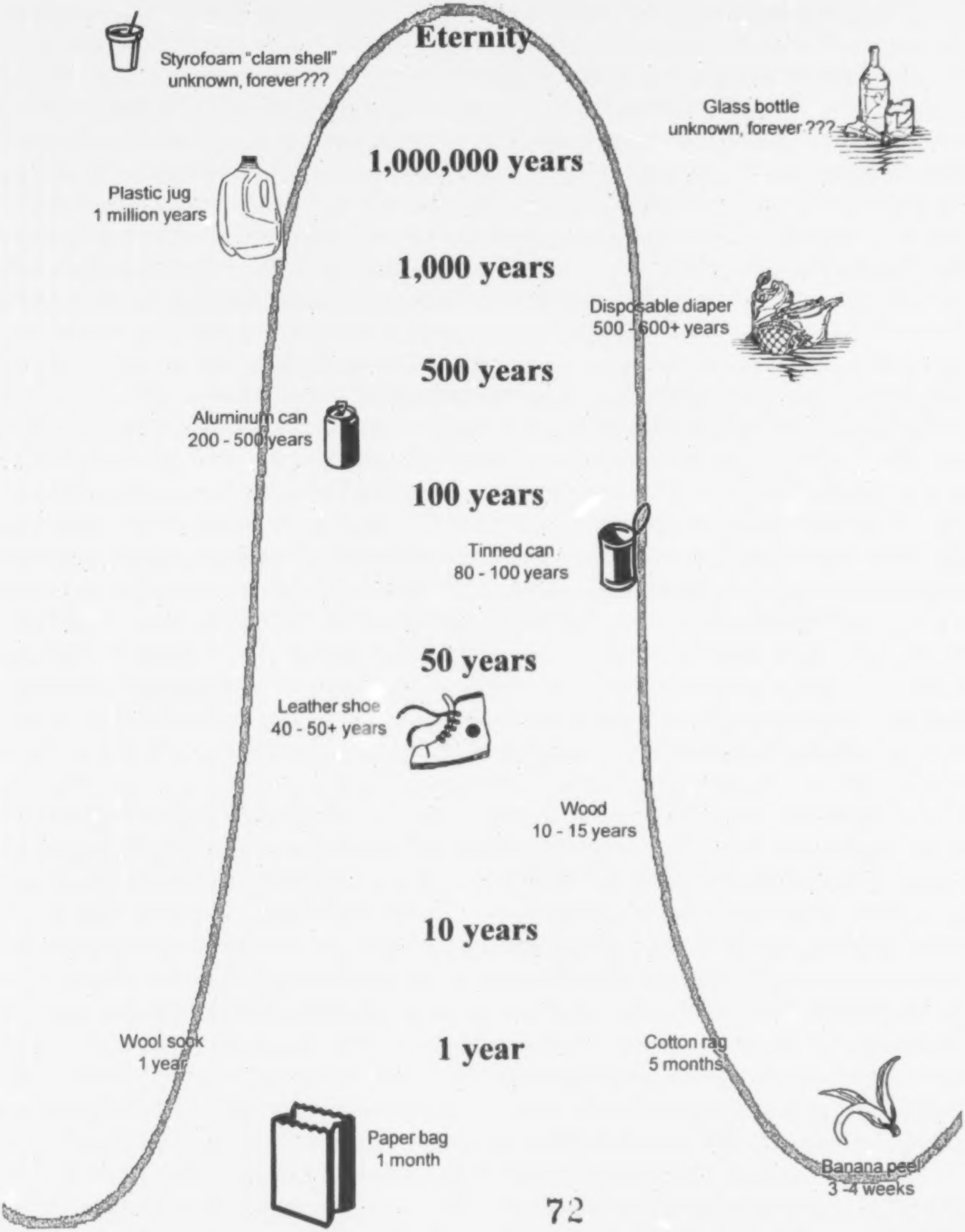
Overhead: A Simple Diagram of a Landfill



1. **Garbage is taken from your house**
2. **Garbage is delivered to the landfill**
3. **Garbage is compacted and buried in a landfill**
4. **Equipment checks the water to make sure it is clean and safe**

Source: California Integrated Waste Management Board: *Closing the Loop: Exploring Integrated Waste Management and Resource Conservation K-6* (2000)

Overhead: When Will These Things Decompose?



Eternity

Styrofoam "clam shell"
unknown, forever???

Glass bottle
unknown, forever ???

1,000,000 years

Plastic jug
1 million years

1,000 years

Disposable diaper
500 - 600+ years

500 years

Aluminum can
200 - 500 years

100 years

Tinned can
80 - 100 years

50 years

Leather shoe
40 - 50+ years

Wood
10 - 15 years

10 years

Wool sock
1 year

1 year

Cotton rag
5 months

Paper bag
1 month

Banana peel
3 -4 weeks

Lesson: Needs and Wants

Grade: K-3
Subject: Social Science, English
Objectives:
Students will:

- discriminate between wants and needs, quantity and quality, necessities and luxuries
- evaluate their own motives for buying things
- think about the long-term consequences of their consumption habits and draw conclusions about how their actions impact the environment

Teaching Time: 45 minutes

Materials: *The Lorax* by Dr. Seuss (book or video); worksheets, Needs and Wants Game Pieces and instruction;

(Optional:) Oregon DEQ video, "Time's a Wasting: Garbage and Recycling in Oregon" (See Teacher Resource section for availability)

Concept adapted from the Association of Vermont Recyclers: *AVR Teacher's Resource Guide For Solid Waste and Recycling Education (reprinted 1999)*

REDUCE
REUSE
RECYCLE

Background:

We all contribute to the solid waste and other environmental problems through our daily habits of purchasing and using resources. Often, items are purchased for convenience without regard for what will happen to the item once we are through using it. By evaluating our motives, assessing the differences between wants and needs, and making conscious pre-purchase decisions to select quality, multiple-use items, we can assume our share of the responsibility for lessening our impact on the environment.

Procedures:

Introduction:

- **What do you really need in order to live?** Write the responses on the board. (Air, water, food, shelter, love, friends, etc.) Compare these items to other items such as cars, toys, or video games, for example.
- **Would your list of basic needs be different if you were a plant or an animal?** (List these needs on the board).
- Read the book or show the video of *The Lorax*.
- **What effect did the Once-ler's business have on the Lorax?**
- **Why was the Super Axe Hacker invented?**
- **Why did the Once-ler ignore the Lorax's warnings?**
- **What happened to the Lorax?**
- **What did the Lorax's message "UNLESS" mean?**
- **How many "Thneeds" (things we think we need) do each of us have?** Have students take turns naming "Thneeds" from their homes or personal belongings.
- Discuss how our "Thneeds" may be different if we were from another country, culture, for example. (You could use Native American views from the lesson as a basis for comparison).
- (Optional) Play the Needs and Wants Game--see instructions in this Lesson.

Reflection/Response:

- Have students illustrate their needs and wants under the titles "Thneeds" and Thwants."
- Distribute the worksheet "Needs and Wants" to older students to complete in class or at home.
- **What are some benefits of reducing the amount of what we buy? Let's think about some valuable things we can get from or give to our families or friends that do not require buying new things.** (Write ideas on the board, examples are: spending time with each other, compose a poem for someone, experiencing things together like a trip to the park or the zoo, loaning books or toys to someone, etc.).
- **What is the connection between our needs and wants and the environment?** The things we buy are all made from natural resources and all cause some pollution while being made and brought to the store for us to buy. That is why we think about using wisely!

Extensions:

- Plant a tree!
- Use the end part of the video Time's a Wasting: Garbage and Recycling in Oregon to show the children about making good pre-purchasing decisions.
- The Lorax spoke for trees "for the trees have no tongues." Have students choose one thing to speak for, decide what they would say and then speak for one minute on behalf of their thing which cannot speak for itself.

Common Curriculum Goal:

English: Literature

- Analyze the development and treatment of themes in a literary work.

Social Science: Analysis

- Identify, analyze, and select a course of action to resolve an issue.

Grade 3 Benchmark:

- Identify character, plot, and setting in a literary selection.
  Students will:
  1. identify main and supporting characters.
  2. identify events important to the development of the plot.
  3. identify setting, including place and time period of a story.
- Identify how people or other living things might be affected by an event, issue, or problem.
- Identify possible options or responses, then make a choice or express an opinion.

Worksheet: Needs and Wants

Student Name:____________________

1. Why did the Once-ler cut down the Truffula trees?____________________

2. Why do the Brown Bar-ba-loots have to leave?____________________

3. What kinds of problems does the thneed factory cause for the environment? Name at least three.

4. What happens to the Once-ler when there are no more Truffula, trees?____________________

5. What happens to the Lorax?____________________

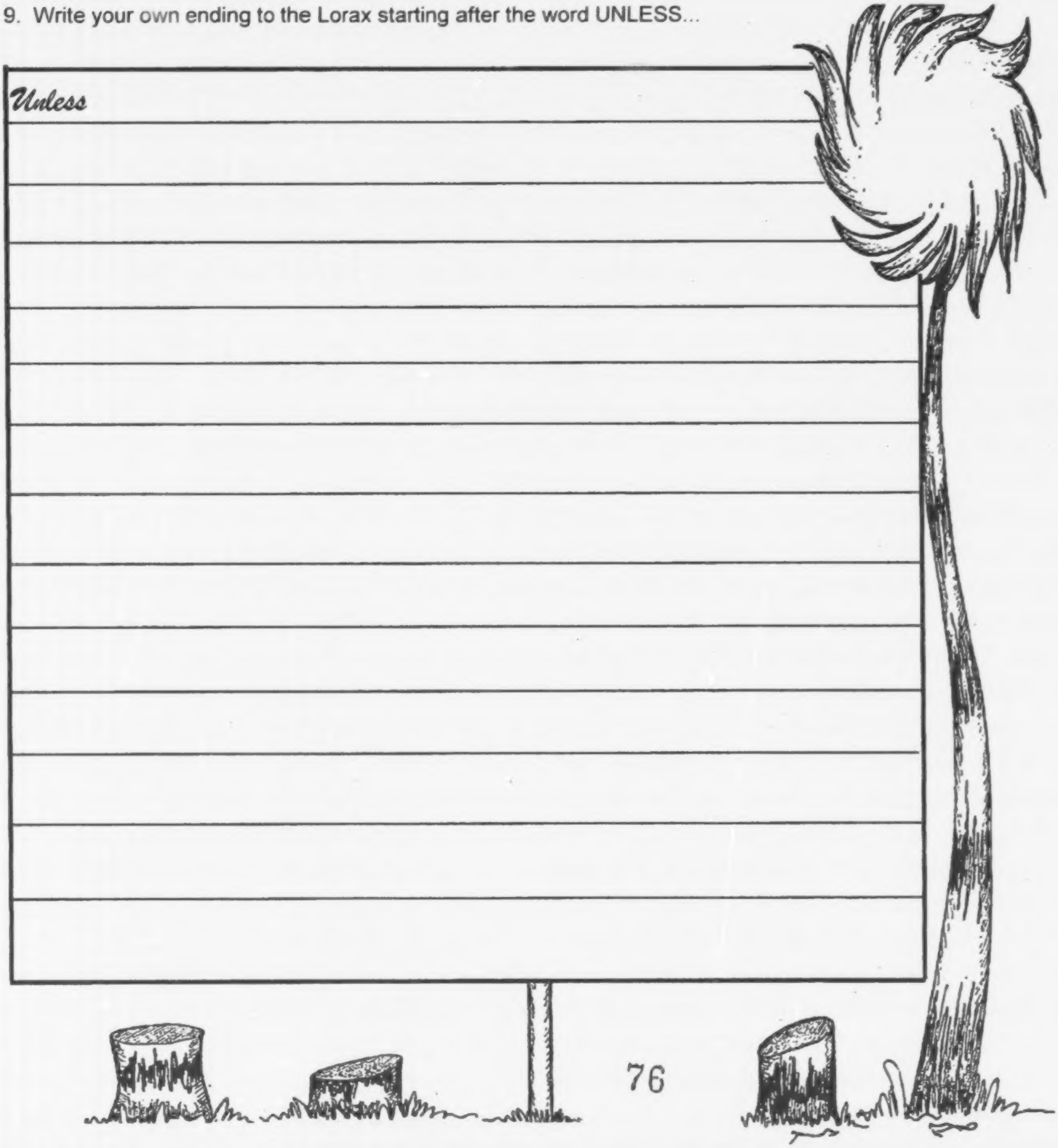
6. Is bigger always better? Give an example to back up your opinion.____________________

7. A "Thneed" is defined as a fine thing that everyone thinks they need. What are some examples of thneeds - things that we think we need?____________________

Source: Association of Vermont Recyclers: *Teacher's Resource Guide for Solid Waste and Recycling Education* (1999)

8. If you were the Once-ler, what would you have done differently to protect the environment?

9. Write your own ending to the Lorax starting after the word UNLESS...



Unless

Needs and Wants Game Instructions

Directions:

1. Copy the Needs and Wants worksheets so that each pair of students will have a set (be sure to single-side the copies because the backs of the cards need to be blank). Cut the cards along the dotted lines and place each set of cards into an envelope. Students can help, and they can mount the cards with glue onto a thicker paper (used file folders, paper board, etc.) to make them more sturdy.

2. Divide the students into pairs. Pass out one envelope of cards to each pair. Direct them to sort their cards into piles that are alike in some way. Ask the students to explain which "rule" they used for sorting the cards. (List the rules the students used on the board). Encourage them to look for new ways to sort the objects if they can think of more.

3. Have students put the cards back into the envelopes, then discuss what is the difference between a NEED and a WANT.

    Can you live without the things you need? What about the things you want?
    Now tell them to resort their cards using this criteria.
    Ask students to define the criteria they used to decide if something is a need or a want. Students might offer answers such as cost, parent/legal permission, personal safety, peers, etc.

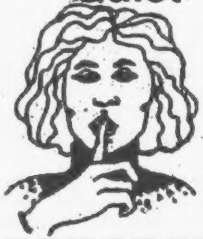
4. Lead a class discussion on basic needs for life and how that might differ from culture to culture. Teach students how affluent societies tend to have more "NEEDS" (really WANTS) because of their lifestyle, but that many of these things are not really necessary.

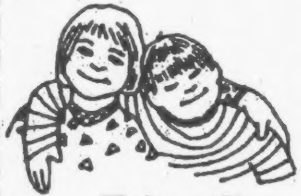
5. Have students make a list of things that they have recently purchased or been given. Write an N or a W next to each item. Have students reflect on the things that they personally own such as toys, electronics, clothes, recreational gear. Ask them to write down examples of things they have multiple copies of such as shoes, jackets, games, stuffed animals. Underline the items that you could do without if you had to and circle the items that you would always want to have. Discuss how students can assess whether or not they have "enough" and how they might find other ways to be happy without accumulating new things all the time and without creating more garbage. Also, you might help students think about the money they and their families can save by foregoing unnecessary purchases. By only buying what we need, we are freeing up our own monetary resources for a better use like a savings account, or the purchase of a more expensive item that will last a long time. Examples of alternatives to our "wants" are: building or creating art or toys for yourself; exchanging one toy for another with a friend or group of friends; go to the library and check out books on new subjects to learn new interests and skills, etc.

Worksheet: Needs and Wants Game Pieces

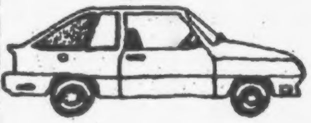
Source: California Department of Health Services Toxic Substances Control Program
The No Waste Anthology (1991)

Quiet

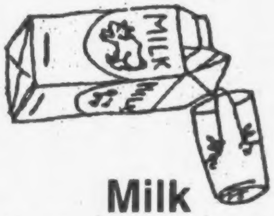




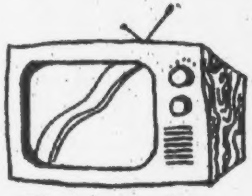
Friends



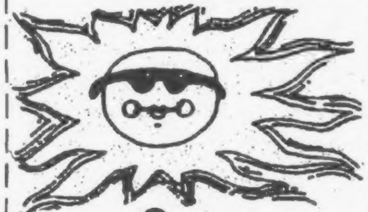
Car



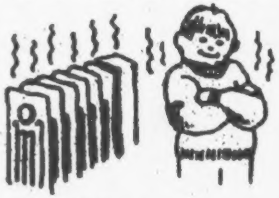
Milk



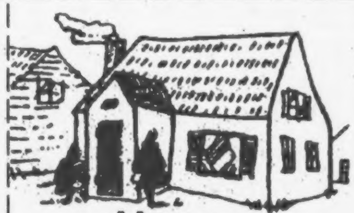
Television



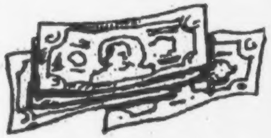
Sun



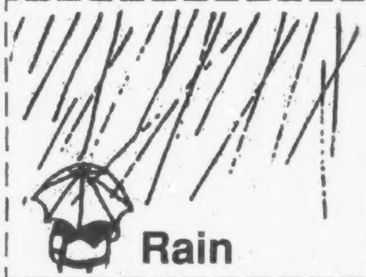
Warmth



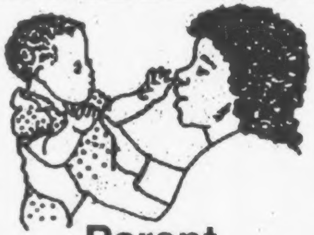
Home



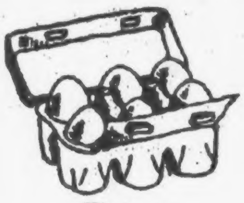
Dollars



Rain



Parent

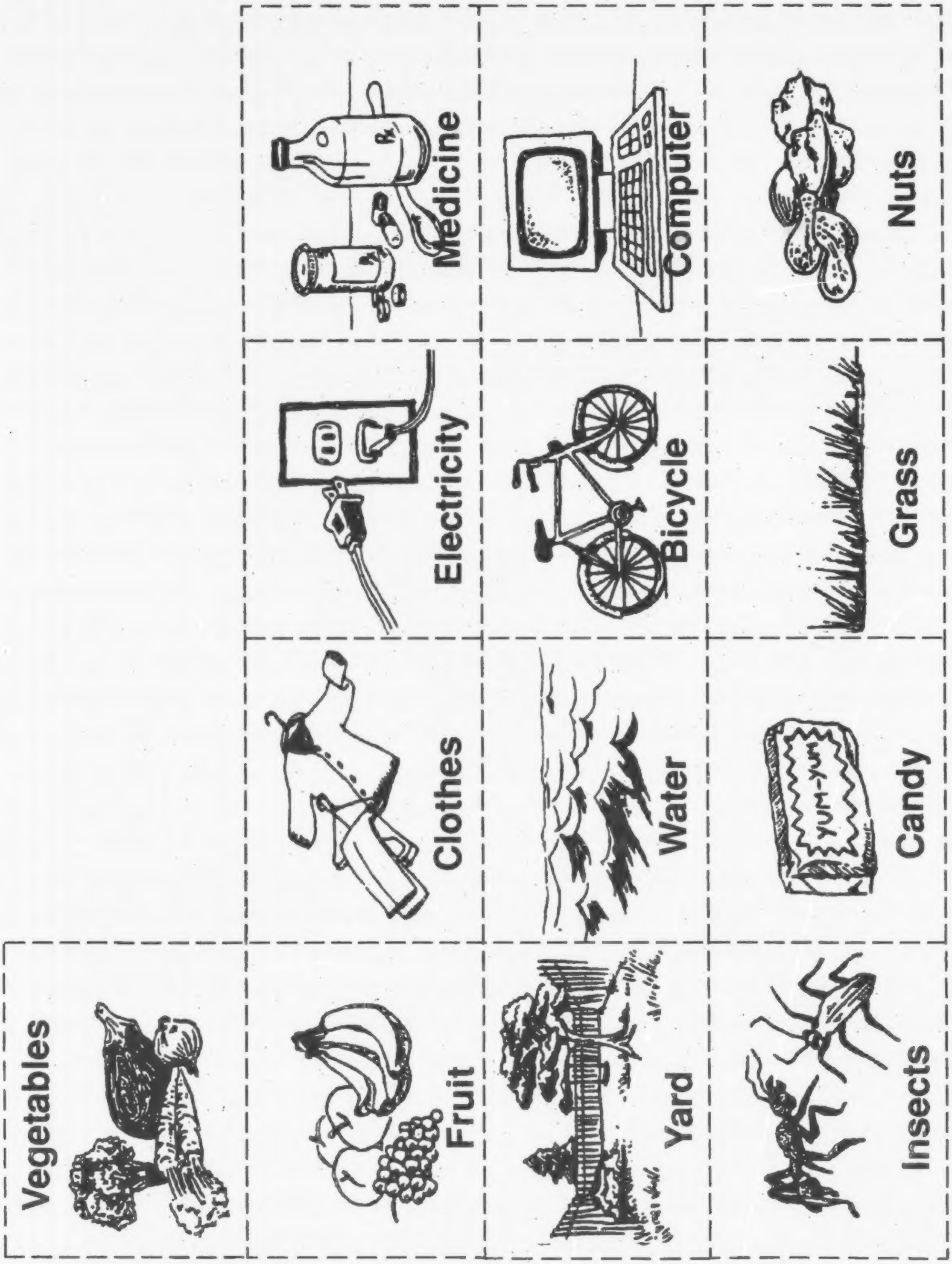


Eggs

Air

Worksheet: Needs and Wants Game Pieces

Source: California Department of Health Services Toxic Substances Control Program
The No Waste Anthology (1991)


Nuts
Grass
Candy
YUM-YUM
Insects
Computer
Bicycle
Water
Yard
Medicine
Rx
Electricity
Clothes
Fruit
Vegetables

Lesson: Ads Add Up

Grade: 2-3
Subject: Social Science, English
Objectives:
Students will:
- identify the purpose of advertising and the messages conveyed by advertising;
- identify the ways people are influenced to buy products and the negative aspects of overpurchasing or buying overpackaged products

Teaching Time: 30 minutes

Materials: Two apples; attractive ribbon; magazine ads (i.e. cereal boxes, beverage containers, snack cakes--things that kids use)

(Optional): video "Time's A Wasting in Oregon"; your own video: copy ads targeting children from television and have the class discuss (See Resource section for availability)

Concept adapted from the Washington Department of Ecology and the South Carolina Department of Health and Environmental Control (see Acknowledgements)

REDUCE
REUSE
RECYCLE

Background:

Prerequisite: Needs and Wants. Advertising and packaging influences what people buy. More and more, advertisers are finding savvy ways to reach the child audience. Research has shown that children as young as 5 years old can understand and recognize commercials that are trying to sell them products.

The following is a quote from a Direct Marketing Association brochure, "Power brands attract new customers more easily and then convert them into loyal, long-term 'brand demanders'. [B]rands are not products, [it] is the personality that animates a product, that brings it to a life in a thousand ways for the consumer." Of course, there is nothing wrong with this type of marketing philosophy, except that these strategies often lead consumers into buying things they don't really need; that may be hard to dispose of properly; that only have a onetime use, etc.

This lesson is designed to help students understand that people have choices when buying products that can affect their personal health (see also, Household Hazardous Waste Lessons), the environment, and can also reduce the amount of garbage they generate. Learning to analyze and evaluate information and to make wise choices when shopping, is a valuable life long skill for students.

Procedures:

- Bring two apples to class and a fancy bow ribbon. Show the apples to the children, placing the bow on one of them. **Which one of these apples would you like to buy?** Many will answer the one with the bow. **What made you want one apple over the other?**
- **What material is the ribbon made of?** Let the class know that the ribbon originated from a petroleum-based material that had to be taken from the Earth's crust. Discuss with the class how packaging eventually ends up in our landfills and uses up our natural resources. **How are products packaged to make you want to buy them?**
- Show a magazine ad that would appeal to the students. **What are the people in this ad doing? Would you like to be one of these people? Why or Why not? Why was this picture taken?**
- **How does advertising try to get you to buy a product?** Make the connection that radio, television and print ads are similar to packaging--all are designed to get you to the store and to buy the product once you are there.
- **How does the ad convince you that this item is a "Need" when perhaps it is really just a "Want"? Have you ever wanted something you saw on television, purchased the item and were disappointed with it because it wasn't as good as promised?**
- Continue to evaluate magazine ads, or have students find ads in newspapers or magazines to discuss with the class. Explore with the class how the advertisement makes them feel and what it seems to be saying or promising.

- (Optional) Show a video that you have made with TV commercials that target kids. Discuss the methods that advertisers use to make their product seem "cool" or "necessary" or "fun". In each case, ask the students to decide whether or not they feel these products would live up to the claims in the ad.

Vocabulary:
advertisement
durable
disposable
commercial
packaging

Reflection/Response:

- Because packaging winds up in our landfills, have students consider ways to reduce the amount of packaging in their garbage can. (*Buy items with less packaging and packaging that can be recycled, buy packaging that can be reused, consider if the item is a want or a need, avoid onetime use items.)*
- Discuss the concept of durable v. disposable. Help students think of alternatives to disposable products that they might use.
- Ask students to create an ad that encourages people to buy a product that lasts.
- Have older students write a persuasive essay to convince others to consider carefully before buying an item.

Extensions:

- Review the end of the video "Time's A Wasting in Oregon" that shows people thinking about the products they buy and their impacts on the environment.

Common Curriculum Goals:

Social Science:

- Explain various perspectives on an event or issue and the reasoning behind them.

English: Writing

- Use a variety of modes (e.g., narrative, imaginative, expository, persuasive) in appropriate context.

Grade 3 Benchmark:

- Identify and compare different ways of looking at an event, issue, or problem.
- Write in a variety of modes (e.g., narrative, imaginative, expository, persuasive).

Lesson: So Many Cookies... So Much Packaging

Grade: K-3
Subject: Science, Math, English (extension)
Objective:
Students will
- discuss the purpose of packaging
- compare the different natural resources used in packaging
- determine that some packaging is easier to recycle than others
- judge if packaging is necessary and appropriate

Teaching Time: 45 minutes

Materials: Five packages of cookies of various types of packaging: bulk--fresh baked; bulk--prepackaged cookies; cookies in a tray, single wrap, etc.; worksheet, Cookie Packaging Chart; Packaging Analysis

Concept adapted from the California Integrated Waste Management Board: *Closing the Loop: Exploring Integrated Waste Management and Resource Conservation K-6* (2000)

REDUCE
REUSE
RECYCLE

Background:

At an early age children need to understand that when they buy something, they also buy the packaging. Packaging has many important purposes, such as: safety, marketing, protecting and transporting the product. However, children have the responsibility as good citizens to see that the packaging is minimal, and that it is reused or recycled, if possible. (Prerequisite: "Natural Resources"). Follow this lesson with "Lunchroom Trash" if it hasn't already been covered.

Procedure:

- **Do you ever have cookies as a snack at home? What type of packaging do the cookies come in?**
- Show the packages of cookies to the class. **Why do you think the makers package the cookies that way?** Students should suggest things like, "so the cookies are not crumbs when they get them home, to make the cookies more appealing, etc." (List the reasons on the board).
- **Which cookies do you think will produce the least amount of waste and which will produce the most?**
- Use the transparency "Packaging of Cookies Chart" as a worksheet or an overhead to compare and record the information.

Reflection/Response:

- **What types of natural resources are used to make packaging?** (Paper=trees, plastic=oil). Explain to the students that trees are an example of a "renewable resource" from the earth because we can replant trees and grow more. On the other hand, oil comes from deep within the ground and takes thousands and thousands of years to form, so we consider this a "nonrenewable resource." People don't really know exactly how much oil exists around the world, and someday we might run out of oil completely. We could also run out of trees if we don't use paper wisely and give the forests time to regrow.
- **What did you learn about packaging today?**
- **What types of packaging are in your lunch from home or the cafeteria? How could you avoid the packaging?** Students should note that they can reuse brown bags, and sandwich bags instead of throwing them away. Also, things that we buy in bulk can be carried in small containers like tupperware or used yogurt containers.
- Emphasize that by carefully choosing the products we buy, we are helping prevent waste and preserve the environment.
- (Optional) Have students guess which brand of cookies was the best buy. Which brand would students choose in terms of taste preference? (Keep a tabulation on the board).
- Calculate the cost/cookie for the students. Did the brand students' preferred end up being a good choice in terms of cost and packaging? Is there a runner up for a better substitute?
- Explain to students that part of what you pay for when you buy a product is the packaging. About $1 out of every $10 spent on food and beverages is the cost of the packaging.

Extension:

- Have students write a (real or pretend) letter to a local grocery store manager asking them to reduce the amount of overpackaged items they stock and to offer products that are designed to be more environmentally friendly.
- Have students write a letter to their favorite cookie manufacturer letting them know their concerns about packaging and the environment.
- Have students design a package for cookies that will protect the cookies, but will not have "excessive" packaging.
- Use packaging materials to create art projects. You might do this in teams of students and have award-winning categories, such as "most creative idea," "funniest idea," and "prettiest idea," etc.)

Vocabulary:
renewable resource
nonrenewable resource

Common Curriculum Goal:
Mathematics: Calculations and Estimations

- Read, write, and order real numbers.

Science: Scientific Inquiry

- Formulate and express scientific questions and hypotheses to be investigated.

Grade 3 Benchmark:

- Perform whole number calculations using paper and pencil and calculators.
- Ask questions about objects, organisms, and events that are based on observations and can be explored through simple investigations.
- Collect data from an investigation.
- Use the data collected to explain the results.

Worksheet: Cookie Packaging Chart

Student Name ____________________

Fill in the data columns. Use the letters A, B, etc. to correspond to your answers in the sixth and eight columns.

Brand of Cookie	Estimated Pieces of Packaging	Estimated # of Cookies	Actual Pieces of Packaging	Actual # of Cookies	What Type of Packaging Was Used?	Is Any Packaging Unnecessary?	Is the Packaging Reusable, Recyclable, or Contain Recycled Content?
					A. Glossy coated bag B. Paper bag C. Paper tray D. Plastic wrap E. Plastic tray F. Other		A. No B. Reusable C. Recyclable D. Recycled-Content E. Don't Know

Worksheet: Packaging Analysis

Student Name:____

1. Which brand of cookie had the least amount of packaging?

____

2. Which brand of cookie had the most packaging?

____

3. Did you discover any brand or brands that you would no longer buy because you found a substitute brand of cookies that had less packaging?

____

4. Did you discover any brands that were better for the environment but were more expensive?

____

What about less expensive?____________________________________

5. Do you think that it is important to identify product choices that you like to use, but have less impact on the environment? Why or why not?

____

____

____

Lesson: Lunchroom Trash

Grade: K-3

Subject: Social Science, Math, English

Objective:

Students will:

- take a first-hand look at excess packaging and determine ways to reduce waste

Teaching Time: 10 minutes before lunch; 35 minutes after lunch

Materials: Four brown grocery bags and one plastic bag for collecting dry materials and food scraps; worksheet, Reducing Waste-What I Can Do; Garbage R's Game instructions; take home handout, Waste-Less Picnic

REDUCE
REUSE
RECYCLE

Background:

Some of the foods and other things we buy have a lot of packaging, or material used to cover, protect, and market the product, while others use little or no packaging. Consider some examples of "packaging intensive" products (fast food meals, individually wrapped cheese slices, and 'ready-to-eat' snacks or other one-time use products like small juice boxes). Compare these to products with natural packaging (bananas, oranges, onions, potatoes, apples, corn on the cob, etc. and things that can be purchased in larger quantities, such as juice, and placed into reusable containers like thermoses or water bottles).

Procedure:

- Label four paper bags-metal, glass, plastic, paper. Label a plastic bag: food.
- **Everyday activities, like eating lunch, create a great deal of trash. As a class, we are going to look at the trash from just one meal.** Have students predict which of the five bags will have the most trash after the meal. You might list predictions on board and make a graph of the actual results.
- For older students, assign a bag with a label to five students. Tell them that they are responsible for collecting that material from each person in the class after they have eaten their lunch. (For drink boxes, etc. tell students to make sure they empty the containers completely before placing them into the bag).

Reflection/Response:

- After lunch, hold up the bags and compare. **Which material is present in the greatest amount? Does this match your prediction? Now pull out any of these materials that are recyclable.**
- Discuss why the food leftovers were created. In some cases, the food is not edible--such as a fruit core or peel, but some is created when we take too much food, or don't like certain things. **It's important not to waste food whenever we can help it because then it just becomes a solid waste (garbage) problem!**
- **What are some of the things in this collection that we could reduce by finding products with little or no packaging?**
- **Are there any of these materials that we could get rid of by switching to a package that is recyclable?**
- As a class, plan the contents of a NO-TRASH lunch. You might take the lunch on your next field trip. Don't forget about tupperware and other reusable single-serving containers and avoid using plastic wrap or aluminum foil. Whenever possible, all containers should be durable or recyclable.
- Have each student complete the worksheet "Reducing Waste-What I Can Do"

Play the Garbage R's game

- Hand out the "Waste-Less Picnic" activity for students to share with their families.

Extension:

- Have students do the Waste-Less picnic activity as an optional weekend assignment and tell the class how they did it, or write a summary about the contents of their picnic and how they chose items that created less waste.
- For a class project, set a No-Trash Lunch display in or near the cafeteria for other students to learn by example. (See Extension Activity in the Teacher Resource section).

Common Curriculum Goal:

Mathematics: Statistics and Probability

- Interpretation of Data
  Read, construct, and interpret displays of data (e.g., charts, tables, graphs) using appropriate techniques and technologies.

Social Science: Analysis

- Define and clarify an issue so that its dimensions are well understood.

Grade 3 Benchmark:

- Collect, organize, display, and describe simple data using charts, tables, number lines, bar graphs, and line graphs.
- Identify an issue or problem that can be studied.

Garbage R's Game

There are more than just three R's actually! We can add to the list for this game: REDUCE, REUSE, RECYCLE, REJECT, RETHINK.

Step 1: Have each student take a piece of paper and carefully tear it into four sections. Sit with the class and brainstorm about trash. Have students write down the name of one thing they usually throw away (be specific) onto each section of paper. (Write each type of object only once - assign a student to write them down).

Step 2: Place the papers into a hat or bowl that will act as the "garbage can" for the game. Make a spinner out of a soda bottle or other object.

Step 3: Get students into a circle and take turns spinning the spinner. When it points to someone, they must pull the paper out of the garbage can and help "remove it" by using one of the R's. For example, they might reuse an item for something else (for example, using a jar for holding pencils), they might reject the purchase of this item for a more environmentally friendly one (such as buying in bulk rather than an individual size) or rethink the purchase of an item that is made for disposal rather than durability (such as a refillable pen instead of nonrefillable). Try to get rid of all the objects in the garbage can! Students will probably need suggestions, but encourage them to be creative. Remind students that waste is just a resource that we just haven't found a use for yet!

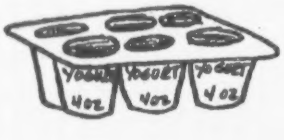
Step 4: (optional) Older students can use the dictionary to find other "R" words that would apply. A suggested list is to the right. Or, use the list on the right and have students finish the sentence when you call out a word, for example, RESIST (purchasing a disposable product), REMANUFACTURE (used products into new ones), etc.

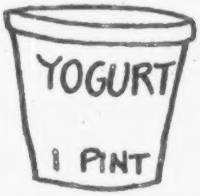
Resist
Remanufacture
Rebuild
Reclosable (container)
Redeem (bottle bill deposits)
Redo
Refurbish
Regenerate
Regrow
Renewable
Remake
Rent (things not used very often)
Renovate
Respectful
Restore
Rejuvenate
Retain (our natural resources)
Revive
Reusable

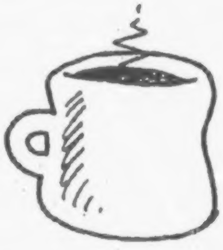
Worksheet: Reducing Waste - What Can I Do?

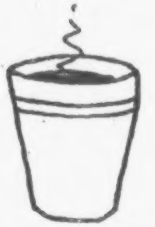
Student Name____

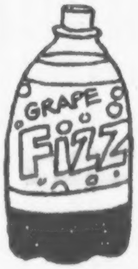
In each box, circle the item that makes less waste or uses less packaging.

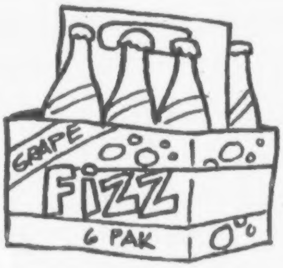

YOGURT
4 oz
YOGURT
4 oz
YOGURT
4 oz

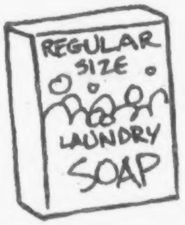

YOGURT
1 PINT

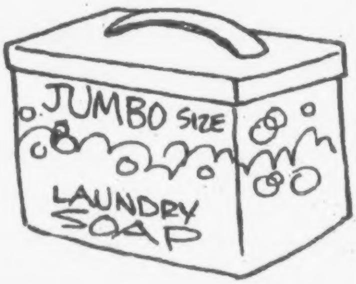


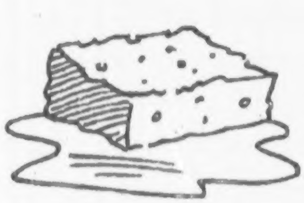


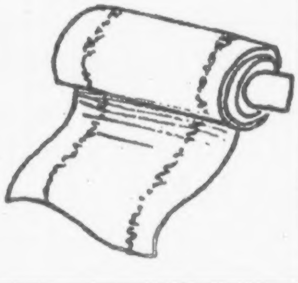


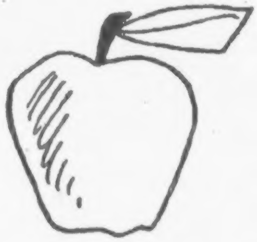

GRAPE
FIZZ
6 PAK

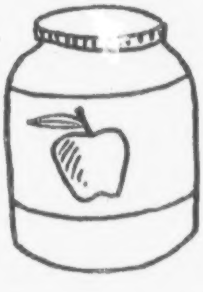

REGULAR SIZE
LAUNDRY SOAP

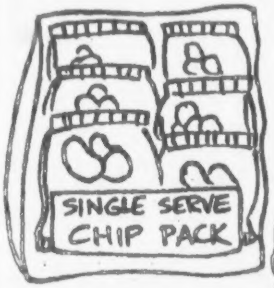

JUMBO SIZE
LAUNDRY SOAP

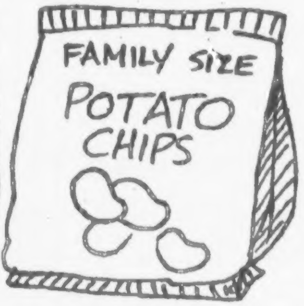


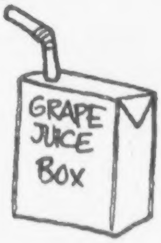


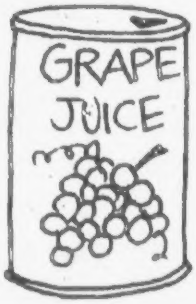





SINGLE SERVE
CHIP PACK


FAMILY SIZE
POTATO
CHIPS


GRAPE
JUICE
BOX

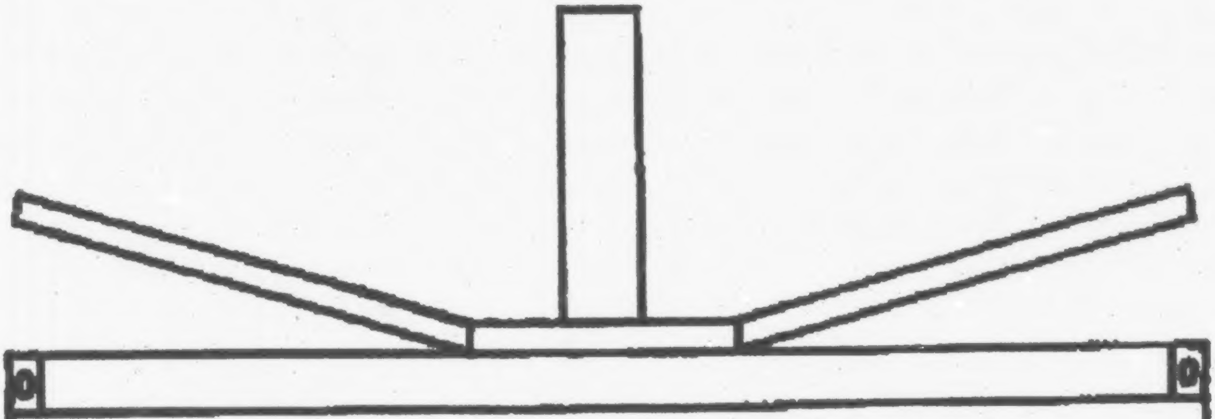

GRAPE
JUICE

Source: Minnesota Office of Environmental Assistance: *Whata Waste K-6 Waste Management Education Curriculum*

Activity: “Waste-Less Picnic”

Dear Parents: This weekend, if possible we’d like your family to enjoy a picnic... a No-Trash picnic that is. At school, your child is learning how to substitute reusable and recyclable items for disposable ones to help create less waste and conserve natural resources. Choose items that are recyclable in your community and substitute reusable containers for things you would throw away.

Thank you for your participation. Watch out for the ants!



Alternatives to Disposable Food Packaging

Food Item	What’s Recyclable	What’s Reusable
Beverage	◆ Aluminum Soda Can ◆ Glass Bottle ◆ Plastic Soda Bottle (#1 or #2)	◆ Thermos with cups/glasses ◆ Refillable glass bottle ◆ Refillable plastic bottle
Sandwich	◆ Aluminum Wrap (clean, rinsed)	◆ ziploc baggies ◆ tupperware
Dessert	◆ Apple, Peach, Pear (eat package then compost the cores, if you can!)	◆ Durable plastic cup with lid for fruit/pudding ◆ Tupperware
Place settings		◆ Metal utensils ◆ Cloth napkins ◆ Tablecloth, blanket
Carrying container	◆ Brown Paper Bag	◆ Plastic Grocery Bag (recyclable at some grocery stores) ◆ Metal/plastic lunch box ◆ Tote bag/backpack/cooler ◆ Wicker picnic basket

Source: South Carolina Department of Health and Environmental Control: *Action for a Cleaner Tomorrow* (1996)

Lesson: Trash or Treasure?

Grade: K-3
Subject: English, Arts
Objectives:
Students will:

- recognize the many things that can be saved and reused
- realize that trading or reselling are good alternatives to throwing away
- identify reuse as an important way to help the environment

Teaching Time:
approximately 40 minutes

Materials: poem, "Hector the Collector" from *Where the Sidewalk Ends* by Shel Silverstein; variety of items that have been "rescued" from the waste can, such as old clothing, a broken tool, a toy, recyclable packaging, etc.; worksheet, Throw Away or Reuse? What I Can Do;

Extension: space for a swap meet.

Concept adapted from the Association of Vermont Recyclers and South Carolina Department of Health and Environmental Control (see Acknowledgements)

REDUCE
REUSE
RECYCLE

Background:

Buying less is an important part of changing the consumer habits that contribute to the waste stream. One of the main ways we can reduce the amount of trash ending up in Oregon landfills is to renew the life of an object by redefining its purpose and by using it again. Trading items can help us reduce the amount of new items we need to buy, and therefore the amount of resources needed to make new products.

Procedures:

- Read the poem, "Hector the Collector." Discuss author's message about junk and treasure. Discuss the positive and negative aspects of "collecting" such as not throwing things away that may still have a purpose or that can be reused by someone or made into an art project, etc. On the other hand, collecting may lead us into behaviors of having and wanting more and more things. Draw from "Needs and Wants" and help students come to some conclusion about how much stuff is "enough" and ways to be happy without buying more and more things.
- **Let's talk about finding more uses for things that we believe are no longer useful to us.**
- **Who might like to play with a toy that you longer want?** (A younger sibling, friends, children who don't have many toys).
- **Are you taller than you were a year ago? What did you do with your old clothes? Can you share clothes you have outgrown with brothers or sisters or friends who are smaller?**
- As a class, brainstorm the benefits of reusing things. They should mention saving money, helping others, prolonging the life of landfills, reducing pollution, and saving natural resources.
- Show the class some examples of items that you have "rescued" from the trash, such as an old shirt, broken tool, toy, recyclable packaging, etc.
- **Which of these items can be reused for its original purpose? Which can be used in a new way?** Students should state that some broken items could be repaired and used again, or that clothing could simply be worn by someone else.
- Use an old box to create a class treasure trunk. Decorate it and remind students to fill it with collectable treasures - REUSABLE MATERIALS!

Reflection/Response:

- Have each student complete the worksheet, "Throw Away or Reuse? What I Can Do."
- Have students bring in "rescued" items from their home trash and have class identify ways it can be reused.
- Older students might write a summary of the class lesson, connecting reuse with the reduction of waste.
- Create a "reused" art object out of assembled materials (for example, make a giraffe or dinosaur--see Let's Make a Mask activity in the Resource section).

- Have students appreciate and discuss the qualities of each person's or group of students artwork and creative use of the materials.

Extensions:

- Have a class contest to name the class treasure trunk (i.e. Planet Protector Box). Try to think of more positive names rather than using a negative word like "junk."
- Organize a school-wide swap meet or clothes drive to be donated to charity.
- Ask parents to donate reusable art supplies (i.e. greeting cards, office paper, etc.)

Common Curriculum Goal:

English: Literature

- Read a variety of literary forms (e.g., novels, poems, plays, short stories, autobiographies, essays) of varying complexity from a variety of cultures and time periods.
- Analyze the development and treatment of themes in a literary work.

Arts: Aesthetics and Art Criticism

- Use of knowledge of technical, organizational and aesthetic elements to describe and analyze one's own art and the art of others.
- Respond to works of art, giving reasons for preferences.

Grade 3 Benchmark:

Students will:

- identify a story, poem, play, or non-fiction selection.
- identify main and supporting characters.
- identify events important to the development of the plot.
- identify setting, including place and time period of a story.

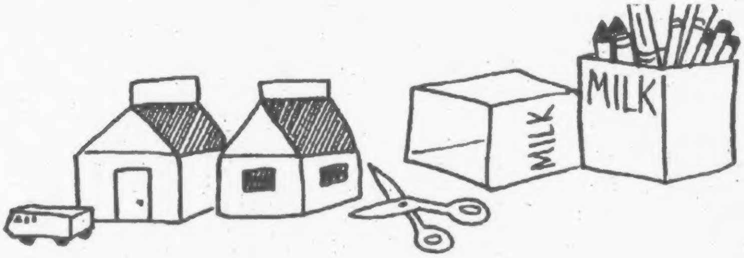
Recognize artistic elements in works of art.

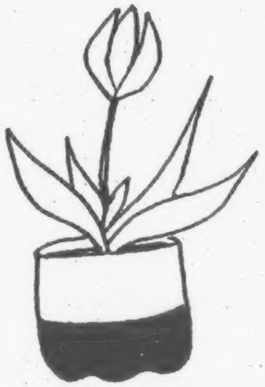
Describe an idea or feeling connected with viewing or hearing a work of art.

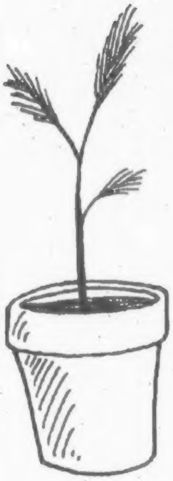
Worksheet: Throw Away or Reuse: What I Can Do?

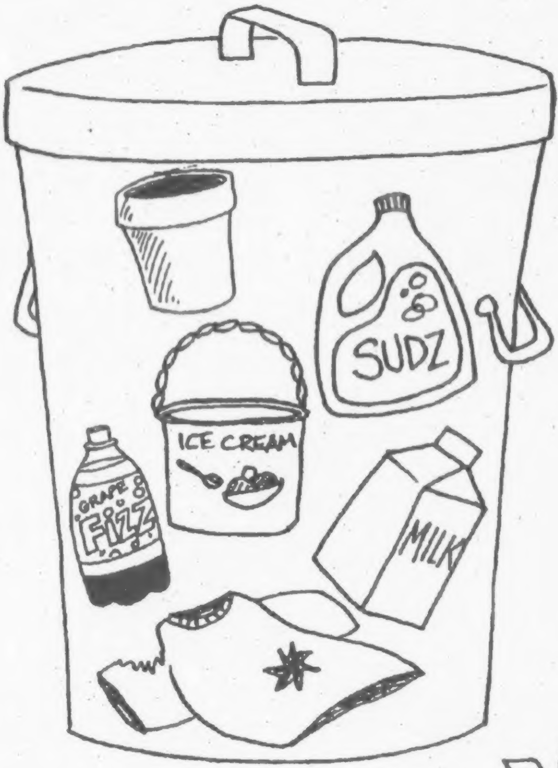
Student Name:____

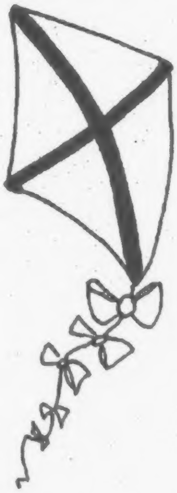
Draw a line from each item in the garbage can to show where it is being reused again instead of thrown away!

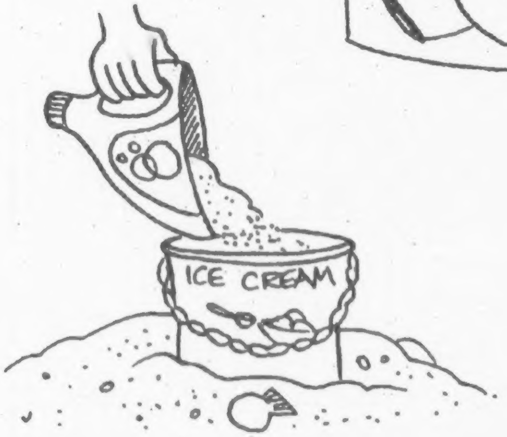


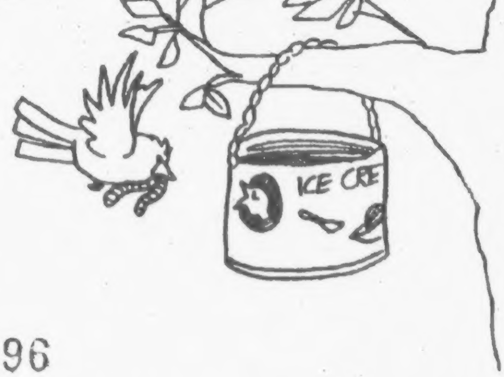




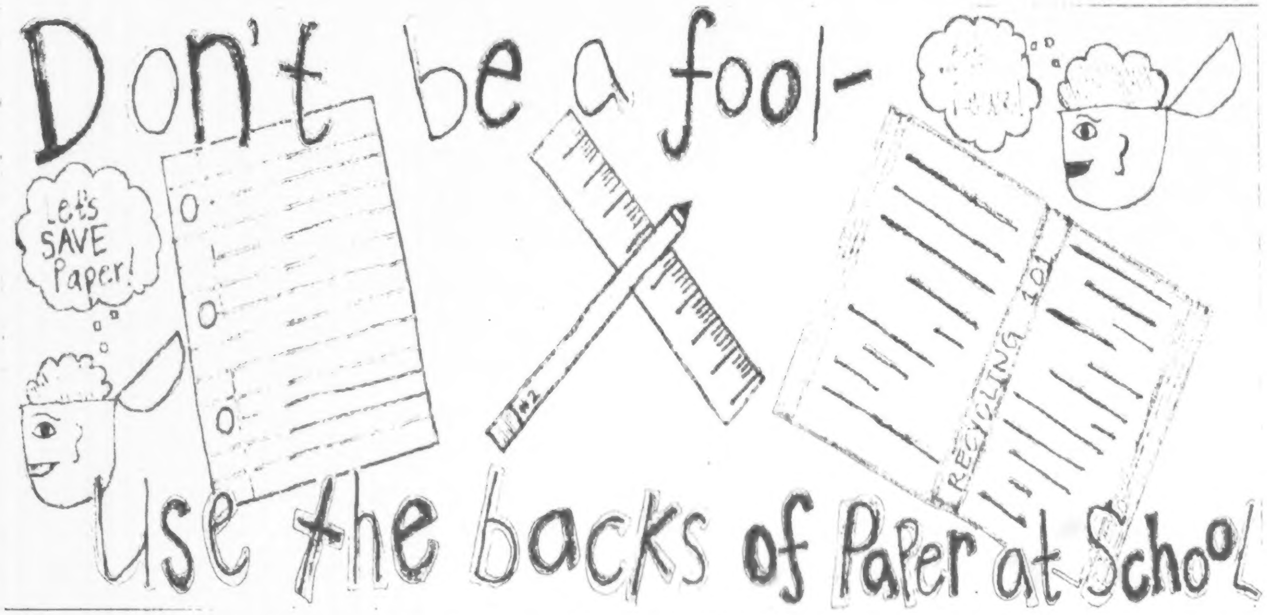

SUDZ
ICE CREAM
GRAPE
FIZZ
MILK







Source: Minnesota Office of Environmental Assistance: *Whata Waste K-6 Waste Management Education Curriculum*


Don't be a fool-
Let's SAVE Paper!
#2
RECYCLING 101
Use the backs of Paper at School

Artwork by Gina Guddemi, Grade 12, St. Mary's Academy. Submitted for the Metro Regional Services Earth Day Bill Board Contest, 2001.

Lesson: Cycles and RE-Cycles

Grade: K-3
Subject: Science and Social Science
Objective:
Students will:
- apply their knowledge of cycles to understanding the process of recycling
- identify recycling as a cycle that can help conserve natural resources

Teaching Time: 45 minutes

Materials: Transparency, Recycle Lifecycle: Glass; instructions for The Cycle Game; 3" x 5" index cards; video, Lifecycle Recycle: Glass and Paper. (See Teacher Resource section for availability)

(Continued)

REDUCE
REUSE
RECYCLE

Background:

(Prerequisite: "Cycles in Nature") Everything that we make, use, and throw away originates from the earth. Natural objects return to the earth through cycles and sometimes people mimic nature by remanufacturing used materials into new materials in a process known as recycling. Thinking in cycles can help us to remember that energy, natural resources and money are all used up in bringing everyday objects to us. By reusing our resources, we can save what would normally be lost in a landfill. A landfill is not part of a cycle because our waste is simply buried and stored for hundreds of years—it is not actually "cycled" back to the earth! (Review Lesson: Look at a Landfill and explain how landfill violate nature's cycle by slowing or stopping decomposition of natural materials).

Procedure:

- Review with students some of the cycles that they have studied already. Students should recall, the days of the week, months of the year, the tree cycle, and the water cycle.
- Draw the cycle of decomposition also know as "composting" on the board. Review how garbage is buried and "stored" in a landfill. **How does a landfill break the natural cycle of decomposition? Air and water is present in very small quantities and sunlight cannot enter at all!** Tell the students that scientists have found newspapers that have been buried in the landfill for more than 20 years that are still readable!
- Write the word "recycle" on the board. **What do you think this word means? It means to make a material into something to use again. It also means that we don't have to mine or harvest raw materials from the earth to make this new item--which saves natural resources and helps reduce pollution.**
  Many cycles depend on people to make them happen. To recycle means to give the object a new beginning by changing it into something can be used again.
- Show the overhead and explain the recycling symbol. **Look for this symbol on packaging or products to see if it may be recyclable in your community or if it contains any recycled content. This is one way you can help "Close the Loop" and be sure that the cycle is completed.**
- Show the video Lifecycle Recycle: Glass and Paper (optional).
- Display the transparency of *Recycle Lifecycle: Glass.* Although it is not nature's cycle, it is created by humans and it does give new life to used objects!

Reflection/Response:

- Have students draw or write a story about the lifecycle of glass and/or paper that they have seen in the video or on the worksheet.

Extension:

- Play "The Cycle Game"

Common Curriculum Goal:
Science: Physical Science and Unifying Concepts and Processes and Science in Personal and Social Perspectives
- Matter: Understand structure and properties of matter
- Apply foundation concepts of change, cycle, cause and effect, energy and matter, evolution, perception, and fundamental entities
- Describe how daily choices of individuals taken together, affect global resource cycles, ecosystems, and natural resources.

Social Science: Analysis
- Identify, analyze, and select a course of action to resolve an issue.

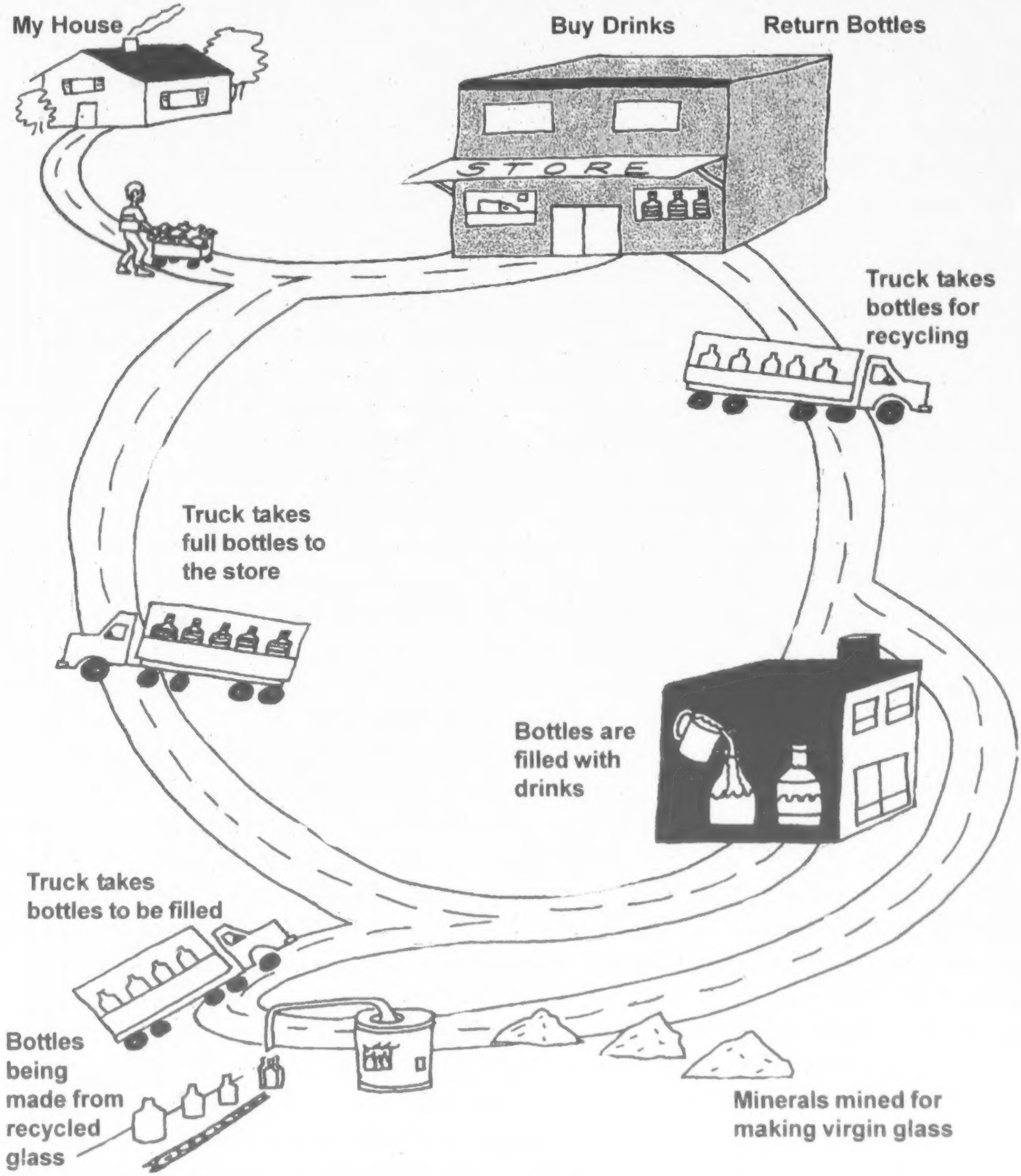
Grade 3 Benchmark:
- Describe objects according to their physical properties.
- Identify examples of change.
- Arrange parts of a cycle.

(Optional:) bring an item from your home that has the recycled symbol and/or recycled-content symbol on it to show students.

Worksheet: Recycle Lifecycle- Glass

Student Name:____

Number the steps of the lifecycle of glass. The numbers will vary in order depending on where you start!

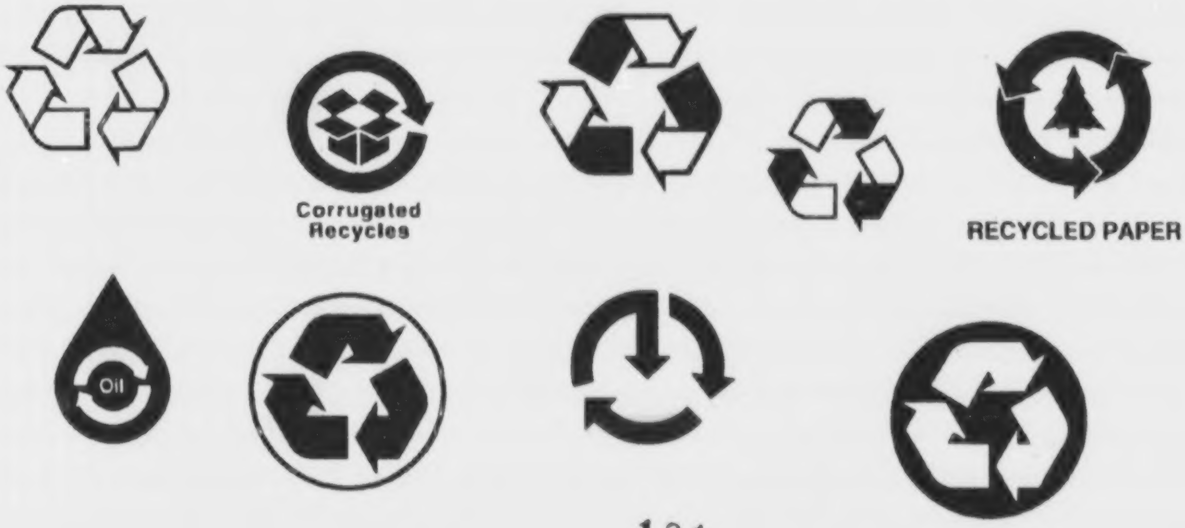

My House
Buy Drinks
Return Bottles
STORE
Truck takes bottles for recycling
Truck takes full bottles to the store
Bottles are filled with drinks
Truck takes bottles to be filled
Bottles being made from recycled glass
Minerals mined for making virgin glass

The Cycle Game

This game helps students understand the meaning of cycles in general, and recycling cycles in particular. As students copy the list onto 3" x 5" cards, discuss which materials come from renewable resources and which come from nonrenewable resources. (For example, plastic and polyester=oil, etc.) These items are a suggested list, add other items if you wish. Refer to the Natural Resource Bulletin Board from Lesson: Natural Resources.

tin can
car
food
minerals
glass
athletic shoe
synthetic clothes
rain
lifecycle of a pet
aluminum
food
metals
paper
wool sweater
building
petroleum (oil)
rubber
book

- Make a stack of 3" x 5" cards, each containing the name of one of the items from the cycle list. Students add their own items as well. Add one extra card that says CREATIVE CARD on it. Place the cards face down in a pile.
- Divide the class into teams of four players.
- Go through the cards one at a time. Give each team 30 seconds to list the steps of a cycle in proper order. (They may want to write the steps down to keep them straight.)
- Teams should also write whether the item is from a renewable or nonrenewable resource.
- One point is given for each step in the cycle, but to be a valid cycle, at least three steps must be given. You can keep score, or assign a student to be scorekeeper for each team.
- An extra point is given if the team has answered the renewable/nonrenewable part correctly.
- When the CREATIVE CARD is drawn, that team may pick any cycle that has not already been used. A CREATIVE CARD cycle is worth 2 points for each step.
- The winning team is determined by total points.



Lesson: Recycle Lifecycle

Grade: K-3
Subject: Science and Social Science
Objectives:
Students will:

- define the word recycle
- learn to recognize the universal symbol for recycling
- be aware that recycling is an alternative to disposal

Teaching Time: For basics of recycling and in class worksheet 30 minutes. Video is 12 minutes. To make "glass" about 25 minutes. At least an hour is needed for the paper making activity (optional).

Materials: transparency, Recycling Symbol: the Chasing Arrows; worksheets, Save these from the garbage can!, Plastics at Home-an investigation, My family can recycle; Chart--Plastics Coding

(Optional:) Make your own paper--see Extensions section
Make your own "glass" using the "Making and Molding Glass Experiment"; video: "Lifecycle of Paper and Glass" (see Teacher Resource section for availability)

Background:

This lesson connects material use and recycling with physical and earth science concepts. To help students understand the connections, read "The Recycling Process After Collection" in the Teacher Resource section so that you are familiar with the processes that materials go through in order to become a new material again. Using the handouts, experiments, and video, you can familiarize your students with the recycling of glass, paper, and plastic. You may want to cover different portions of this lesson on successive days.

Recycling keeps waste out of Oregon's landfills and saves precious natural resources. Of course, some energy, waste, and raw materials are used during the recycling process, but overall, much less pollution and waste is generated than in the manufacturing of virgin products. If you are unfamiliar with what types of materials you can recycle in your community contact your local city or county solid waste department before doing this activity because you will need to help students complete the checklist on the activity sheet: "My Family Can Recycle".

Procedures:

- Make a list of all the advantages to recycling on the board. Call on volunteers to read an advantage from the board and try to explain HOW they think recycling creates this advantage.
  1. Reduces pollution
  2. Saves natural resources
  3. Saves energy
  4. Saves money
  5. Extends the life of a landfill
  6. Creates jobs
- Show students the symbol for recycling (three arrows) (See transparency Recycling Symbol.) Label the steps of the recycling process represented by the arrows. Older students can be taught the difference in the shaded and the non-shaded designs.

Reflection/Response:

- Help students complete the checklist on the handout "My Family Can Recycle" and take it home to share.
- Discuss how each of these materials come from the earth, some are bound in the crust and some grow on the land, like trees.
- Discuss how substances change form during the recycling process. Most are changed from a solid to a liquid and go back to a solid again. Heat and other chemicals are necessary to make these changes happen. However, much less heat and chemicals are needed, in general, than when these materials were made the very first time. That's why recycling is good for the earth!
- Show video Lifecycle of Paper and Glass.
- Now have students complete the worksheet, "Save these from the garbage can!"
- Go over the Plastic Codings Chart and assign the worksheet "Plastics at Home--an investigation" for homework.

Extensions:

- Make recycled paper (see papermaking lesson in the Teacher Resource section).
- Make your own "glass" using the "Making and Molding Glass Experiment
- Assign the Activity: Environmental Fortune Teller in the Resource section.

Common Curriculum Goal:

Science: Unifying Concepts and Processes, Physical Science, Earth and Space Science, Science in Personal and Social Perspectives

- Apply foundation concepts of change, cycle, cause and effect, energy and matter, evolution, perception, and fundamental entities.
- Understand the properties and limited availability of the materials which make up the Earth.
- Formulate and express scientific questions and hypotheses to be investigated.
- Understand chemical and physical changes.
- Describe how daily choices of individuals taken together, affect global resource cycles, ecosystems, and natural resources.

Social Science: Analysis

- Identify, analyze, and select a course of action to resolve an issue.

Grade 3 Benchmark:

- Describe objects according to their physical properties.
- Identify examples of change.
- Identify materials that make up the Earth.
- Ask questions about objects, organisms, and events that are based on observations that can be explored through simple investigations.

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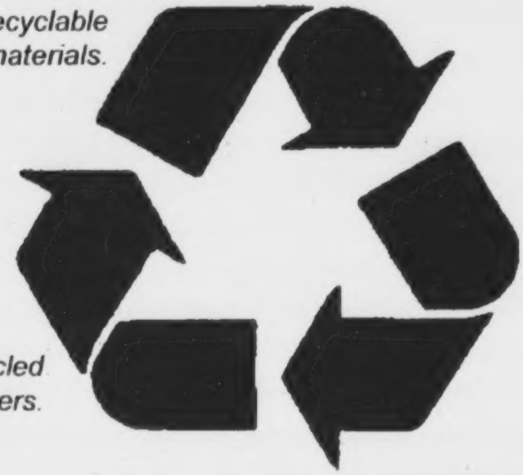
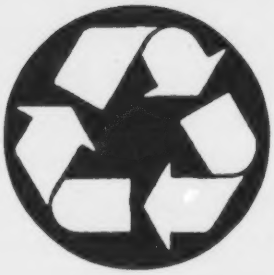
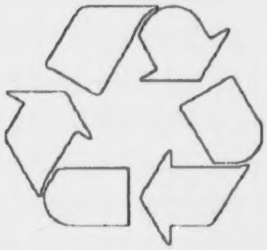
Overhead: Recycling Symbol - The Chasing Arrows

This is the universal symbol for recycling. The three arrow design represents a never-ending process: the three phases of recycling. If you look carefully, you can see the outline of a tree in the center of the symbol.


Collection of recyclable materials.
Remanufacturing into new products.
Purchase of recycled products by consumers.

Recycled: This symbol identifies products and packages that are made at least partially from material that has been used before, i.e. "post-consumer waste", which is waste from your home, school, or office. It might also contain "pre-consumer waste", which is waste during the manufacturing process that is put back in.





Recyclable: This symbol identifies products and packages that can be recycled. In other words, it can be sorted from your garbage, collected by your local recycler, and made into a new product. However, not all materials are collected in all areas because of lack of places to sell the materials, poor prices, or difficulty in collecting or storing.

Keep in mind that a product can be both recyclable and have recycled-content, like the paper used to print these activities. It contains 50% post-consumer recycled waste paper and 50% unbleached pulp. It can also be made into new paper when you no longer have a use for it.

Handout: Plastics Coding System

Abbreviation	Scientific Name	Properties	Examples	Environmental Qualities
PETE 1 PETE	polyethylene Terphtahalate	usually clear or green, sinks in water, rigid, glossy	soda bottles butter jars	recycled into fleece coats, carpet, surfboards
HDPE 2 HDPE	high density Polyethylene	semi-rigid, sinks in water	milk, water jugs juice, bleach bottles	recycled into plastic lumber products like picnic tables
PVC 3 V	polyvinyl chloride	semi-rigid, glossy sinks in water	detergent/cleaner bottles, pipes	the by-products from manufacturing are known to cause cancer; recycled into handrails, house siding
LDPE 4 LDPE	low density polyethylene	flexible, not crinkly	6-pack rings, bread bags, sandwich bags, grocery bags	recycled in small amounts into bags
PP 5 PP	polypropylene	semi-rigid, low Gloss	margarine tubs, screw-on lids, straws, car bumpers	used in the auto industry, difficult to collect for recycling; recycled into car battery cases
PS 6 PS	polystyrene	often brittle; glossy	Styrafoam, packing peanuts, egg cartons	no longer made with CFCs, but the by-products from manufacturing degrade air quality; recycled into pencil holders, tape dispensers
7 Other	multi-layer Plastics	squeezable	ketchup and syrup bottles	layered aspects make this difficult to recycle; recycled into benches, marine pilings

Worksheet: Plastics At Home - *An Investigation*

Student Name:____

Look around your home for things packaged in plastic (# 1-7). Fill in the chart below.

Which plastic code number was the most common (occurred the most frequently)?________________

Which plastic code number(s) were rigid (not bendable)?____________________________

Which plastic code number(s) were clear in color?________________________________

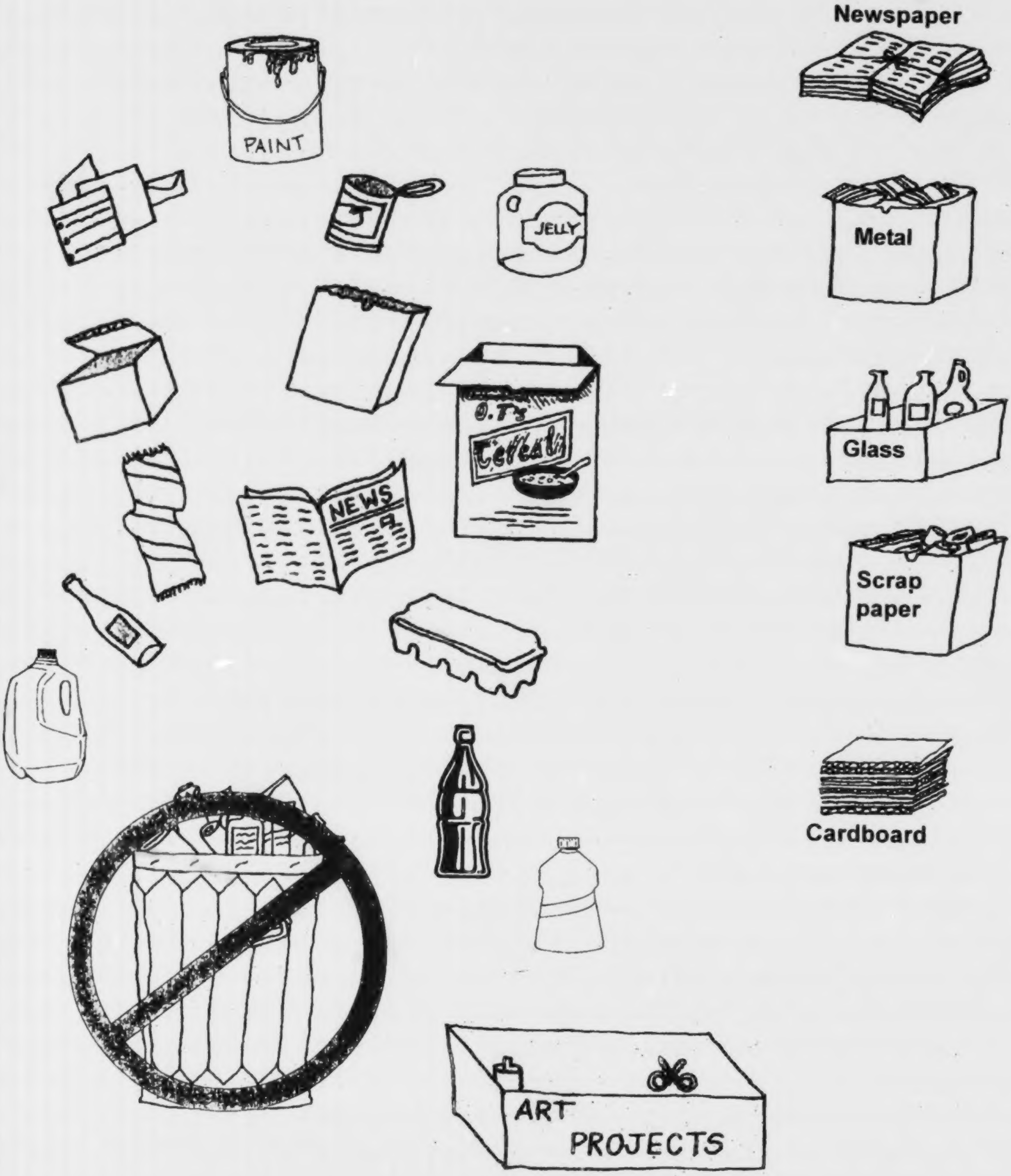
Which plastic code number(s) were squeezable?________________________________

Product and size of product in a plastic container	Plastic container code number	Recyclable in your community? YES/NO	Disposal method for this plastic (landfill or recycling center)	How can this plastic be reused?
Example: *gallon of milk*	*2*	*YES*	*Recycling Center*	*For a storage container; planter; piggy bank.*
1.				
2.				
3.				
4.				
5.				
6.				
7.				

Worksheet: Save These From The Garbage Can!

Student Name:____

Draw a line from the item to the proper recycling bin. Remember to use the "Art Project" box for items that could be reused instead of or before being recycled!


Newspaper
PAINT
JELLY
Metal
O.T's
Cereal
Glass
NEWS
Scrap paper
Cardboard
ART PROJECTS

Worksheet: My Family Can Recycle

Dear Parent: your child has been learning about recycling as a way to conserve natural resources, help manage the garbage problem, and reduce pollution. The following list shows what can be recycled in this community. Please keep it as a guide if you do not already have one.

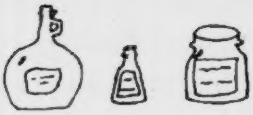
Plastic

☐ rinse, flatten

☐ no caps

☐ numbers 1 2 3 4 5 6 7 (circle the numbers that can be recycled in your community)

Glass



☐ mix all colors together

☐ recycle metal lids

☐ separate clear brown green (circle the colors that are separated)

Metal

☐ rinse, remove label (recycle label with scrap paper)

☐ flatten, remove ends

☐ do not remove ends

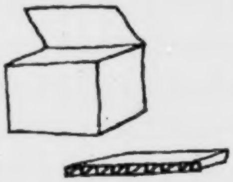
Motor Oil

Illustration by [illegible]

☐ take to an authorized collector (auto store, gas station, service center)

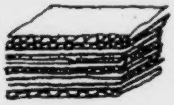
☐ at curbside, in a container with a tight fitting lid

Cardboard



☐ flatten

☐ no pieces larger than ______________



Scrap paper (mixed paper)

☐ writing paper, mail

☐ grayboard (cereal boxes, egg cartons, etc.)

☐ no wax coated papers (freezer containers, etc.)

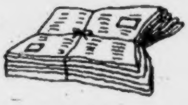
☐ separate from newspaper

Newsprint

☐ bundled

☐ not bundled

☐ include magazines with newspaper



The ____________________________ Family Recycles! Because we want Oregon to remain a beautiful place to live, our family pledges to recycle as much as we can, as often as possible.

Extension: Making and Molding Glass

The Making of Glass

The following activity simulates the making of glass, substituting sugar for sand. Glass is manufactured by heating sand, lime and soda until the mixture melts. After it cools, it is poured into molds and injected with air. By participating in this activity, students will gain an understanding of the heat and energy required to melt and make the glass mixture, and of the process involved in glass manufacturing and recycling.

Materials:

1 cup sugar
Electric frying pan or hot plate and pan
Sheet of glass
1/4 cup water

Heat the water. When it boils pour in the sugar. Stir this mixture vigorously over heat until the sugar is dissolved, about 5 minutes.

Carefully pour the mixture onto the sheet of glass. (If the glass is small enough, set it inside a cookie sheet to prevent runover). Allow to cool, about 15 minutes. Then hold up the two sheets of glass so students can see through them. By allowing it to set overnight, the "glass" will become frosted.

The Molding of Glass

The following activity simulates the molding of glass. All bottles and jars were once made by glass blowers who blew bubbles with the molten glass mixture and formed them into shapes which hardened as they cooled. Injecting air into the molten glass mixture in a mold forms manufactured bottles and jars. By participating in the following activity, students will understand how glass is molded during the recycling process.

Materials:

Stiff straw or glass tubing
Balloon
Wide-mouthed jar
Rubber band to hold the balloon to the straw

Fix the balloon onto the end of the tube or straw with the rubber band. Put the balloon into the jar and ask students to blow up the balloon to fill the jar, which acts as a mold.

Notice how this pile of crushed glass (also known as glass cullet) resembles a pile of sand, the natural resource from which it was created.

Lesson: Composting In A Jar

Grade: K-3
Subject: Science, Arts (extension)
Objectives:
Students will:

- examine how some wastes are recyclable through composting
- learn vocabulary words: decompose and composting

Teaching Time: 20-30 minutes; then variable observing and questioning time

Materials: Large clear plastic or glass jar (optional: one jar for each student); food scraps (fruit peels, bread), leaves, grass clippings, and soil (garden, NOT potting). Except for the soil, you might want students to collect these materials from home or the cafeteria; worksheet, Will I Compost?

(Optional:) magnifying lens; Video: "Worm Bin Creatures Alive Through a Microscope" (see Teacher Resource section for availability)

REDUCE
REUSE
RECYCLE

Background:

Composting organic wastes is a natural process of aerobic decomposition, which allows nutrients in organic material to return to the soil and enrich it for plant growth in the future. Bacteria, fungus, and worms all help in the composting process. In the presence of air and moisture, these organisms decompose plants, releasing energy in the form of heat. (Prerequisite: "Cycles in Nature"). Vermicomposting is a special form of composting in which Red Wiggler worms are used to break down food waste into organic material that can be returned to the soil.

Composting is an excellent way of "recycling" organic waste at homes and at schools in order to keep this valuable carbon-rich material from entering the landfill where it can no longer be utilized by nature. In fact, organic material entering a landfill will gradually break down, but under anaerobic conditions, which causes a by-product of methane gas to be formed. Methane is a gas known to contribute to global warming and is a problem at landfills because it can cause fires and explosions. Thus, keeping organics out of our wastestream is not only beneficial to the environment, it also makes landfills much easier and safer to manage.

Procedures:

- **Do you know what happens to the leaves that are on the ground in the fall? Where do they go next summer?** Make the connection that a tree's leaves fall on the ground, decay into the soil, and nourish the tree by making the soil richer. Thus helping the tree to grow and make more leaves. **This is called decomposition.**
- **When people help food and natural materials decompose, this is called 'composting.' Composting is a natural way to recycle! Today, we are going to build a model of a compost pile that will help plants and food to decay or 'compost' into the soil.**
- (Optional: Assign students or teams to do this activity along with you as a model.) Place two inches of soil in the bottom of a clear or plastic jar. Moisten for best results. Place food, leaves, and grass scraps on top of the soil in several, repeating layers.
- Leave the jar open and place on a window sill or other location where it will not be disturbed. Observe the jar daily, noting any changes. WATER a little every week and stir contents to keep it slightly moist.
- On the second day-**What do you think is happening to the materials?** If the students don't mention it, introduce the word decompose again. **When items break down and rot they are decomposing.** Ask the students to theorize "how" the items break down. Write their theories on the board. Then explain how little bugs called "microorganisms" live in the soil and help break down natural materials.
- (Optional) Show the video "Worm Bin Creatures Alive Through a Microscope" See Resources section to obtain the video from DEQ.
- After a few weeks of observing the different items, show students the decompostion times using the transparency "When will these things Decompose?" in Lesson: Look at a Landfill.

Reflection/Response:

- Have students draw and record the results of the decomposing in a daily log for several weeks.
- Using one or more magnifying lenses, have students take turns looking at the compost and trying to find the small bugs that live in the soil. Ask the students to draw pictures of the microorganisms in their daily log.
- **Does anyone have a compost bin in their yard at home? What are the benefits of a backyard compost bin?** (Reduces waste going to the landfill or incinerator, provides nourishment for plants when we add it to the soil for home gardens.)
- Help students make the connection that natural items can usually decompose, while man-made objects such as steel or plastic cannot and have students complete the worksheet "Composting in a Jar".

Extensions K-1:

- Use several jars, have students compare how different material decompose. Put food scraps, yard wastes, paper, plastic pieces, etc. in separate jars. Have students observe how these materials vary in the way they decompose.
- Sing "Banana Peel Blues" to the tune of "Take Me Out to the Ballgame" in the Lesson: Fun with Songs.

Reflection/Response (cont. for 2-3):

- Create a chart or graph illustrating the decomposition times of the items composted.
- Complete the worksheet "Composting in a Jar".

Extensions 2-3:

- Develop a mural or class skit that shows demonstrates The 3 R's and its benefits.
- Draw a picture or tell a story about the new life of an apple core after it decomposes.
- Build a worm bin for your class or school and/or build a composting system for your school yard waste. (See reference materials for Vermicomposting and Composting in the Teacher Resource section).

Note: Materials in landfills take much longer to decompose (if they ever do!) because they are not exposed to air, water or sunlight, all of which aid decomposition. If we practice the 3 R's: Reduce our waste that we generate, Reuse everything we can, Recycle as much as possible and only throw things away as a last resort, fewer resources will enter our landfills and we'll help preserve our environment for many years to come!

Common Curriculum Goal:

Science: Unifying Concepts and Processes, Physical Science, Scientific Inquiry

- Apply comparison concepts of gradient, scale, symmetry, quantification, and invariance.
- Apply explanatory concepts of model, system, theory, probability, and replication.
- Understand chemical and physical changes
- Formulate and express scientific questions and hypotheses to be investigated.

Grade 3 Benchmark:

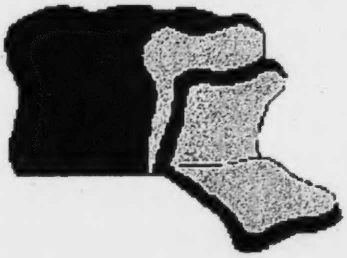
- Identify examples of change over time.
- Describe how some things change and some things remain the same.
- Describe changes that occur in matter.
- Ask questions about objects, organisms, and events that are based on observations and can be explored through simple investigations.

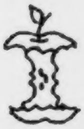
Worksheet: Will I Compost?

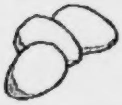
Student Name:____

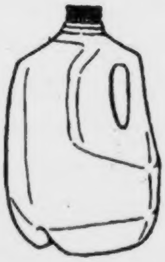
Draw a Circle around each picture that represents something that is natural such as plants and foods. These types of things can be "composted" or broken down and returned to the earth and are called "Organic".

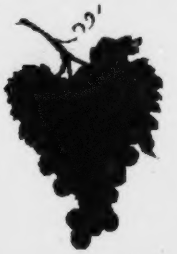
Draw a Square around each picture that represents something that is artificial or made by people, also known as "Inorganic". These types of things cannot be composted, but sometimes they can be recycled. Put on "X" through the square of the objects that can be recycled.

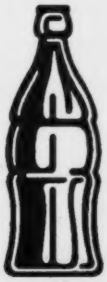


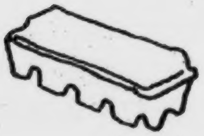


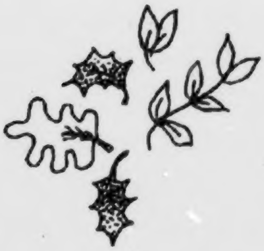


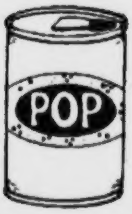


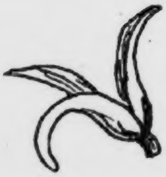


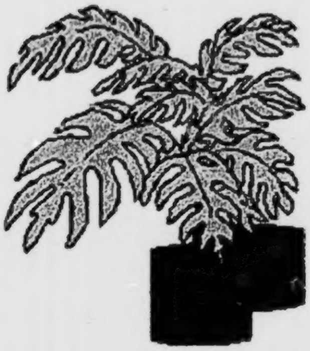


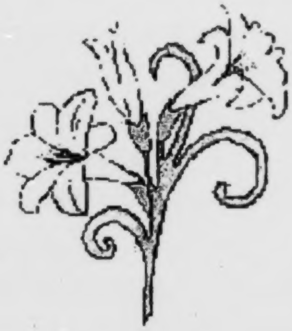


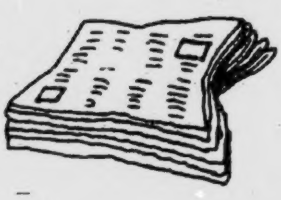


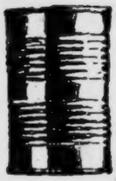












Lesson: Primary Songs

Grade: K-3
Subject: Arts, English
Objectives:
Students will:

- use familiar tunes to write lyrics about recycling and reusing materials
- learn and sing songs composed by other students and analyze the meaning of the new lyrics
- (optional) make musical instruments out of discarded items and use them in the performance of their songs.

Teaching Time: 20-30 minutes; more time is needed to include the optional musical instrument activity.

Materials: transparencies, "On Top of the Landfill"; "In Room 10"; "Join Us Recycle"; "Pick It Up Recycle"; "Litter is Garbage"; and "Banana Peel Blues".

(Optional:) Making a Musical Instrument activity. Instructions and pictures or examples of the real musical instruments that the students are mimicking.

Concept: California Integrated Waste Management Board: *Closing the Loop: Exploring Integrated Waste Management and Resource Conservation K-6* (2000)

REDUCE
REUSE
RECYCLE

Background:

Through writing and singing songs, students can reinforce what they have learned about reusing and recycling their trash. By making instruments out of discarded items, students perform authentic tasks related to rescuing trash from Oregon landfills and bolster their creativity.

Procedures:

- If you plan to make musical instruments, ask students to bring materials to class and follow the directions for making musicals . Write materials list on the board for children to copy.
- You might have the class sing the original song of "On Top of Old Smokey" before using the transparency, "On Top of the Landfill."
- Discuss the song. "What story is this song telling?" Encourage students to share their thoughts.
- Repeat the above procedure with "In Room 10."
- Similar songs and lyrics are listed below:

"Twinkle, Twinkle Little Star"
Twinkle, twinkle little can
You don't belong in a garbage can
It is better if you're reused,
Or melted down and corners fused
Then a new can you become,
Providing food and drink for some
lyrics by Cara Morgan, CA

"Itsy Bitsy Spider"
Reduce, reuse, recycle
Everything you can
And you will give the Earth
A nice helping hand
lyrics by Olga Clymire, CA

"I'm a Little Teapot"
I'm a little red bin
Short and square
Put me at the curb
To show you care
lyrics by Natasha Stillman, CA

"Are You Sleeping"
We recycle, We recycle
Paper and cans and glass
We won't fill the landfills
or take the homes from animals
With our trash, With our trash

Reflection/Response:

- Ask students or small groups to make up their own songs and share them with the class.
- Ask students to write a description of their homemade instruments and how it works.
- Ask students to compare their homemade instruments with the real-life instruments they represent. What are the similarities and differences?

Extensions:

- Perform a concert or create a class musical for parents or other classrooms.

Common Curriculum Goal:

Arts: Create, Present, and Perform

- Apply artistic elements and technical skills to create, present and/or perform works of art for a variety of audiences and purposes.

English: Writing

- Use a variety of modes (e.g., narrative, imaginative, expository, persuasive) in appropriate context.

Grade 3 Benchmark:

- Create, present and/or perform a single form of art, using experiences, imagination, artistic methods and composition to achieve desired effect
- Write in a variety of modes (e.g., narrative, imaginative, expository, persuasive).

Making Musical Instruments

Ask students to bring in the following materials for the musical instruments listed below:

Drum: soup can, oatmeal container or coffee can; balloon; string or rubber band
Drumsticks: sticks wrapped in cloth and taped with masking tape
Tambourine: flip tops off soft drink cans or plastic bottle caps, coat hanger wire, tool to poke holes in bottle caps
Percussion instrument: wood blocks, sandpaper, glue
Rattle: soft drink cans; rocks, seeds, or beads; tape
Shaker: plastic containers with lids; dried beans, other seeds, or small stones; or two paper plates, beans, tape
Clay pot chimes: clothesline rope, small clay pots
Kazoo: cardboard roll from toilet paper, piece of wax paper to close off one end, rubber band
Harp: rubber bands or fishing line, tacks, shoe box
One-string bass: five to six feet of heavy string or clothesline rope; a large can, bucket, or washtub; a broom handle or dowel rod about five feet long

On Top of the Landfill

(sung to "On Top of Old Smoky")

On top of the landfill
All covered with trash,
I stacked all my bottles
They fell with a crash.
If I had recycled
Or even reused,
This world that we live in
Would not be abused.

I picked up my bottles, I picked up my cans,
I looked all around me
And came up with a plan.
Now when I go shopping
For something to drink,
I'll check the containers;
Now what do you think?

And when I need cookies, Or popcorn for treats,
I'll look for less wrappings; Now isn't that neat!
So now I'll recycle, Reduce, and reuse;
My world will be brighter, Since wisely I choose.

Lyrics by Bonnie Styles's third-grade class,
Las Palmas Elementary School, (National School District.) C A
Source: California Integrated Waste Management Board:
***Closing the Loop: Exploring Integrated Waste Management and Resource Conservation K-6* (2000)**

Illustration by Antonia Mando ©[illegible]

Join Us Recycle

(To the Tune of Waddle-le-ah-cha camp song, add hand motions depending on appropriateness for the age of the students.)

Reduce and recycle.
We've used it before
Let's try it once more.

Join us recycle.
You can recycle.
Save resources now.
I'll show you just how.

Easiest thing,
there isn't much to it.
All you've got to do
is commit yourself to it.
Let's keep Earth alive,
help species survive,
when we recycle, reuse it too.

Words by Eileen Stapp 1997
Clackamas County Recycling Partnership **eileens@co.clackamas.or.us**

Pick It Up Recycle

(sung to "Pick a Bale o' Cotton")

Try this song with hand motions that work for you.
Appropriate for primary grades.

Chorus:
Gotta jump down, turn around
Pick it up, recycle
Gotta jump down, turn around,
Recycle every day. (Repeat)

Newspaper, I'm a good recycler,
Glass and Steel, recycle every day.
School Paper, I'm a great recycler,
Junk mail, make it go away.

Sing one line with hand motions. Have students echo back. Sing entire song together, then repeat chorus at a faster pace.

(Words by Eileen Stapp 1991)
Clackamas County Recycling Partnership, eileens@co.clackamas.or.us

In Room 10

Sung to the tune of "This ole Man"

In Room 10, We reduce,
We wont fill landfills too soon.

If you want to be happy, save your trash today,
In Room 10, we've found the way.

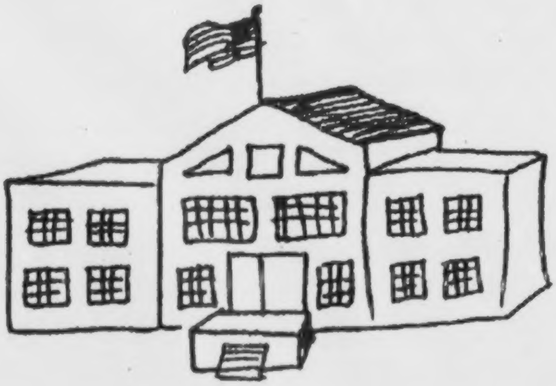
In Room 10, We reuse,
We don't toss what others might use.

If you think it's trash, then really think again
Before you put it in the bin.

In Room 10, We recycle,
We recycle all we can.

Paper, plastic, aluminum, and glass,
We will make our resources last.

Lyrics by Lynda Mooney's first grade class, Las Palmas Elementary School (National School District), CA
Source: California Integrated Waste Management Board: *Closing the Loop: Exploring Integrated Waste Management and Resource Conservation K-6* (2000)



Litter Is Garbage

Sung to "Wheels On The Bus"

Litter is garbage that wasn't put away,
Wasn't put away, wasn't put away.
Litter is garbage that wasn't put away,
In the garbage can.

I put my garbage in the garbage can,
The garbage can, the garbage can.
I put my garbage in the garbage can,
I'm not a litterbug.

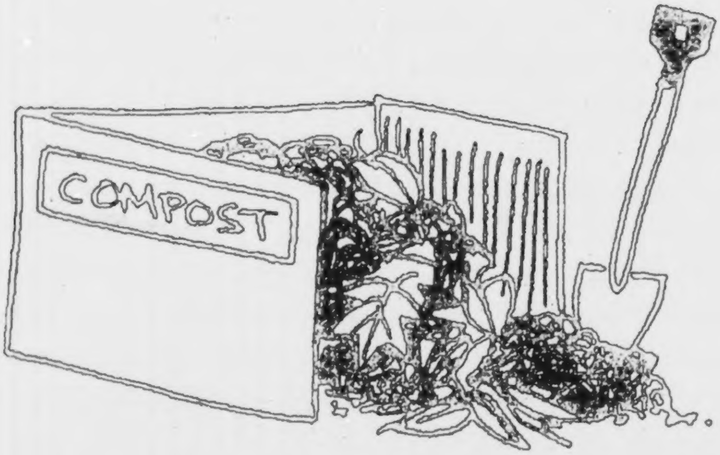
Gayle Bittinger

Source: Minnesota Office of Environmental Assistance: *Whata Waste K-6 Waste Management Education Curriculum*. Originally borrowed from "Totline" *Learning and Caring about Our World*, Gayle Bittinger, Warren Publishing House, Inc.

"Banana Peel Blues"

(sung to the tune of "Take me out to the Ballgame")

Take me out to the compost,
Take me out to the heap
Chop me up into tiny bits;
I don't care if I'm brown at the tips
Cause it's root, root, root, for recycling
If we all compost we'll gain
For it's 2,4,6 weeks I'm out to the old garden.



Lesson: Hazardous Products Substitutes

Grade: K-3
Subject: Science, Health education
Objectives:
Students will:

- recognize signal words and visual symbols that indicate the presence of hazardous substances
- identify "how much" of various products would be dangerous to people or to the earth
- create a recipe book for safe substitutes for home use

Teaching Time: 40-50 minutes

Materials: transparencies, Signal Words, Routes of Exposure, Learning about Labels; worksheet, Identify the Hazards; Play, *Rocky's Not-So-Fun Adventures*; take home sheets, Tips for a Safer Home and Safe Substitute Recipes; worksheet, Sink to Stream

experiment: food coloring; water; two large containers of glass to hold about 8 ounces of colored water; tablespoon/ teaspoon set; eye droppers; small cups

(Continued)

REDUCE
REUSE
RECYCLE

Background:

Understanding the symbols and words that identify products which contain hazardous substances can help students avoid potential dangers. In addition, by pointing out these warnings, it may be possible to shop more carefully for the least toxic alternative for a given job and to wear the proper protective clothing when dealing with toxic substances. To learn more about hazards in the garbage see the Background in Lesson: Where is Away?

Procedures:

- Show class three cups labeled: "Caution", "Warning", and "Danger". You might want small groups of students to each have three labeled cups.
- Display the overhead, "Signal words" and identify the words "caution", "warning", "danger".
- Explain that something that has the label caution is the least dangerous, but sometimes there are products that perform the same function that are even less dangerous because they carry no warning labels at all. Help students understand that it is always better for human health and the environment to choose the least toxic product necessary to do the job.
- Display the overhead "Learning about Labels". (Optional) show the students examples of products with warning labels, or use the labels that have been removed from the products, or use magazine cut outs of these types of products.
- Each group should also have a set of measuring spoons, an eye dropper, and a container filled with colored water.
- Measure two tablespoons of colored water and pour into the "Caution" container.
- Measure one teaspoon of colored water and pour into the "Warning" container.
- Measure one drop of colored water and pour into the "Danger" container.
- **The amounts in each container are the amounts of each product that would seriously hurt or kill a 150 lb. adult. Which product is the most dangerous?**
- The Danger label--it has only one drop of colored water.
- **How are you different from a 150 lb. adult? Would it take more or less of a hazardous product to make a child sick?** Less.
- **What type of protective clothing or measures should be worn when cleaning/working with chemicals?** In some cases, items worn might include: gloves, goggles (safety glasses), ventilation masks (surgical mask), and special protective overalls. (Optional: show gloves, mask and goggles to the students if you have examples).
- Show the overhead "Routes of Exposure." Have students identify the parts of the body these items protect (eyes, lungs, skin) and to identify the 5 routes into the body for hazardous substances (eyes, nose, mouth, ears, skin).

- Fill the second large container or glass with water only. Ask students if they think it would be okay to dump hazardous chemicals into rivers, lakes or streams. Explain that by pouring chemicals into the sink or toilet, means that chemicals may get into our rivers, lakes and streams from overflowing septic systems or waste water treatment plants during heavy rains or when chemicals are difficult to remove thoroughly from the waste water.
- **There is a lot of water running in our rivers, lakes and streams. If each person puts just a small amount of chemicals into the water supply it will all get "washed away", right? Let's do an experiment to see what happens.** One at a time, have each student come forward and drop a drop of colored water into the plain water. Prompt students to observe how the color of the water changes as more students add colored water.
- **Who can tell me what is happening to the water? Do you think the same thing might happen to our rivers, lakes and streams, if we aren't careful with dangerous chemicals at our homes? Yes!**

Reflection/Response:

- Give students the take home handouts "Tips for a Safer Home" and "Safe Substitute Recipes" and have students create "Less Toxic" cleaning recipe books. With teacher's help, students can copy out some substitute product "recipes." Use magazines to cut out pictures of nature, clean air, and water for use in decorating their books.
- Have them create a pledge to try one or more less toxic substitutes at home and take it home for their parents to sign.
- (Optional) Fill spray bottles with vinegar and water and allow students to practice cleaning windows or mirrors.

Extensions:

- Perform the play "Rocky's Not-so-Fun Adventures".
- Make advertisements for the "new" products that will substitute for the hazardous ones. (Review "Ads Add Up" and discuss how ads make us believe that chemicals are better than natural cleaners).
- Visit the Oregon Department of Environmental Quality's Household Hazardous Waste website at: http://www.deq.state.or.us/wmc/solwaste/hhw.html and have students report on their findings.

Common Curriculum Goals:

Science: Unifying Concepts and Processes

- Apply explanatory concepts of model, system, theory, probability, and replication

Health Education: Safe and Healthy Environment

- Explain safe physical, social and emotional environments for individuals, families, schools and communities
- Understand and apply strategies to improve and maintain individual, family, school and community health

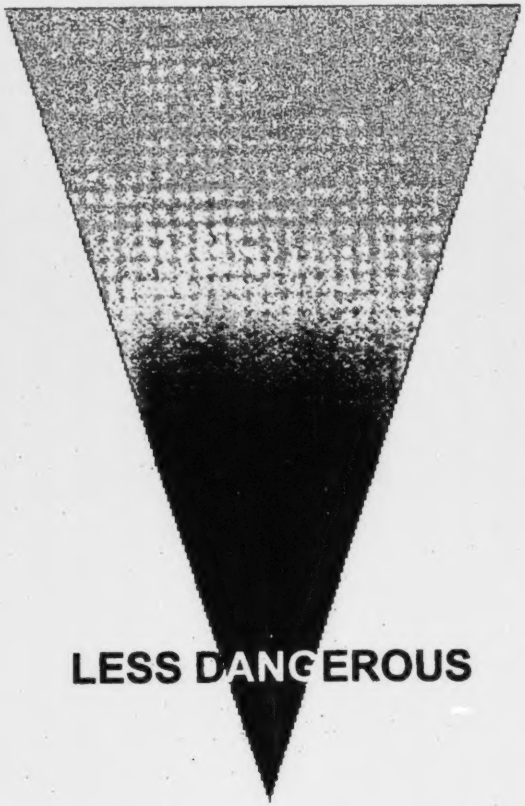
Grade 3 Benchmark:

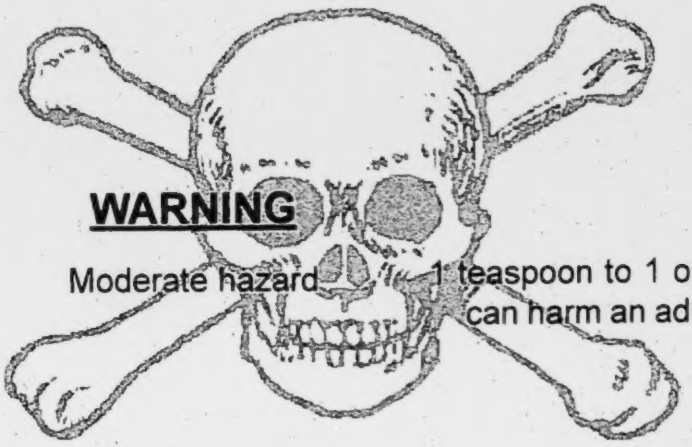
- Compare objects, drawings, and constructions to the real things they represent

(Optional:) examples of products with labels containing the words caution, warning, danger, or remove the labels from the products, or use magazine cut outs; dishwashing gloves; a surgical mask; goggles; general art supplies; magazine pictures of nature, a spray bottle, vinegar and water, two puppets (for the play).

- To find out more about safe disposal in your area, contact the city or county solid waste official or call the Household Hazardous Waste Hotline: 800-732-9253.

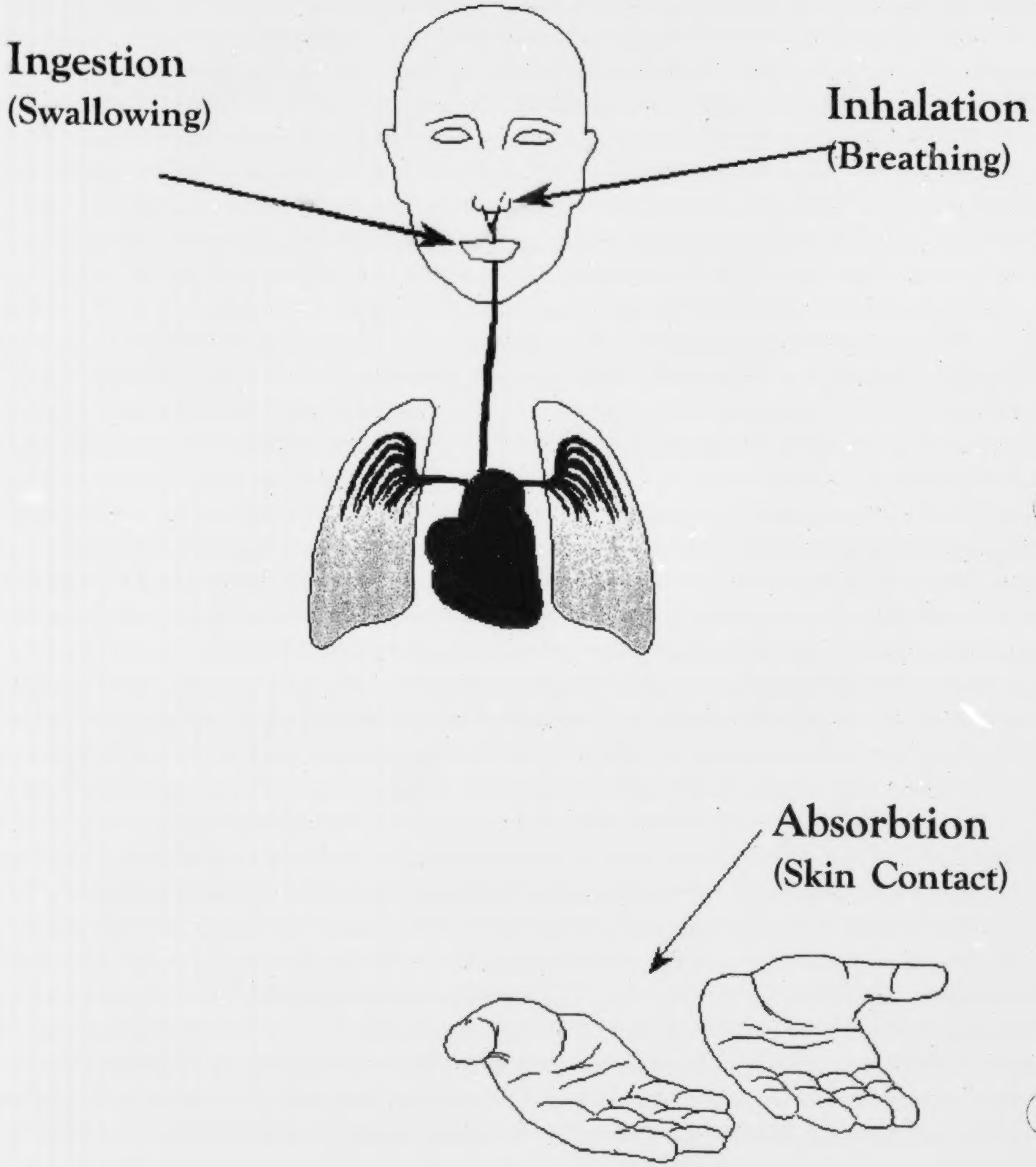
READ LABELS, LOOK FOR SIGNAL WORDS.





DANGER	Extremely flammable, corrosive or highly toxic (poison)	Less than 1 teaspoon can harm an adult
WARNING	Moderate hazard	1 teaspoon to 1 ounce can harm an adult
CAUTION	Mild/moderate hazard	1 ounce or more can harm an adult

Overhead: Routes of Exposure

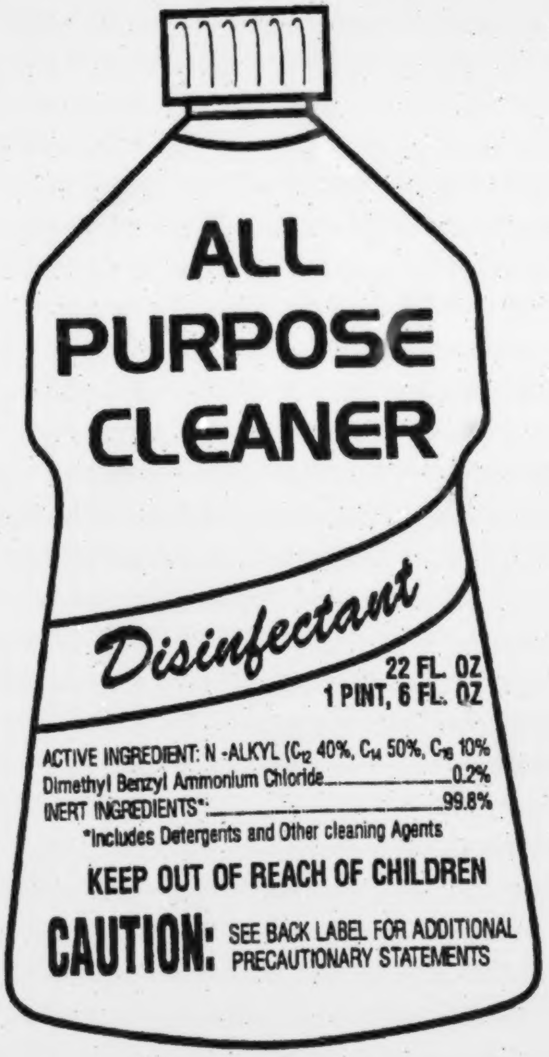


Ingestion
(Swallowing)

Inhalation
(Breathing)

Absorbtion
(Skin Contact)

Overhead: Learning about Labels


ALL PURPOSE CLEANER
Disinfectant
22 FL. OZ
1 PINT, 6 FL. OZ
ACTIVE INGREDIENT: N -ALKYL (C_{12} 40%, C_{14} 50%, C_{16} 10%
Dimethyl Benzyl Ammonium Chloride 0.2%
INERT INGREDIENTS*: 99.8%
*Includes Detergents and Other cleaning Agents
KEEP OUT OF REACH OF CHILDREN
CAUTION: SEE BACK LABEL FOR ADDITIONAL PRECAUTIONARY STATEMENTS

WORDS ON LABELS THAT MEAN HAZARDOUS

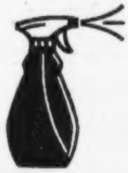
Caution
Corrosive
Danger
Explosive
Flammable
Keep away from children and pets
Harmful if swallowed
Ignitable
Warning
Poison
Toxic

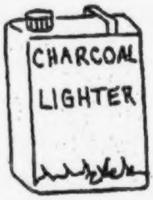
Image courtesy of California Integrated Waste Management Board

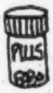
Worksheet: Identify the Hazards

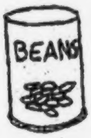
Student name: ______________________________

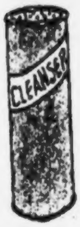
Circle the items that are most likely to be a hazard to people or the environment if used or disposed of incorrectly.

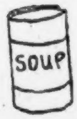


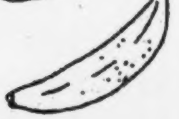

CHARCOAL
LIGHTER

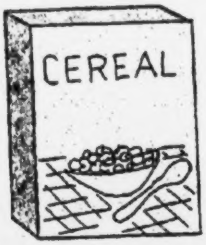


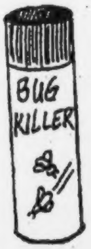


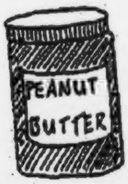


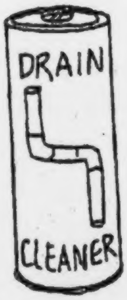


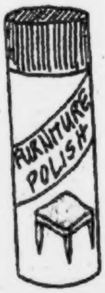


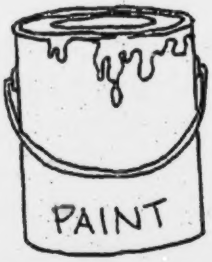


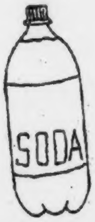


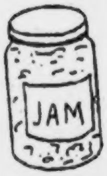

PEANUT
BUTTER

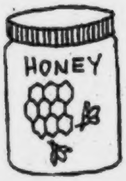

DRAIN
CLEANER

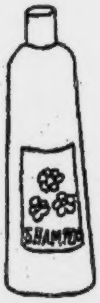

FURNITURE
POLISH

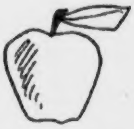










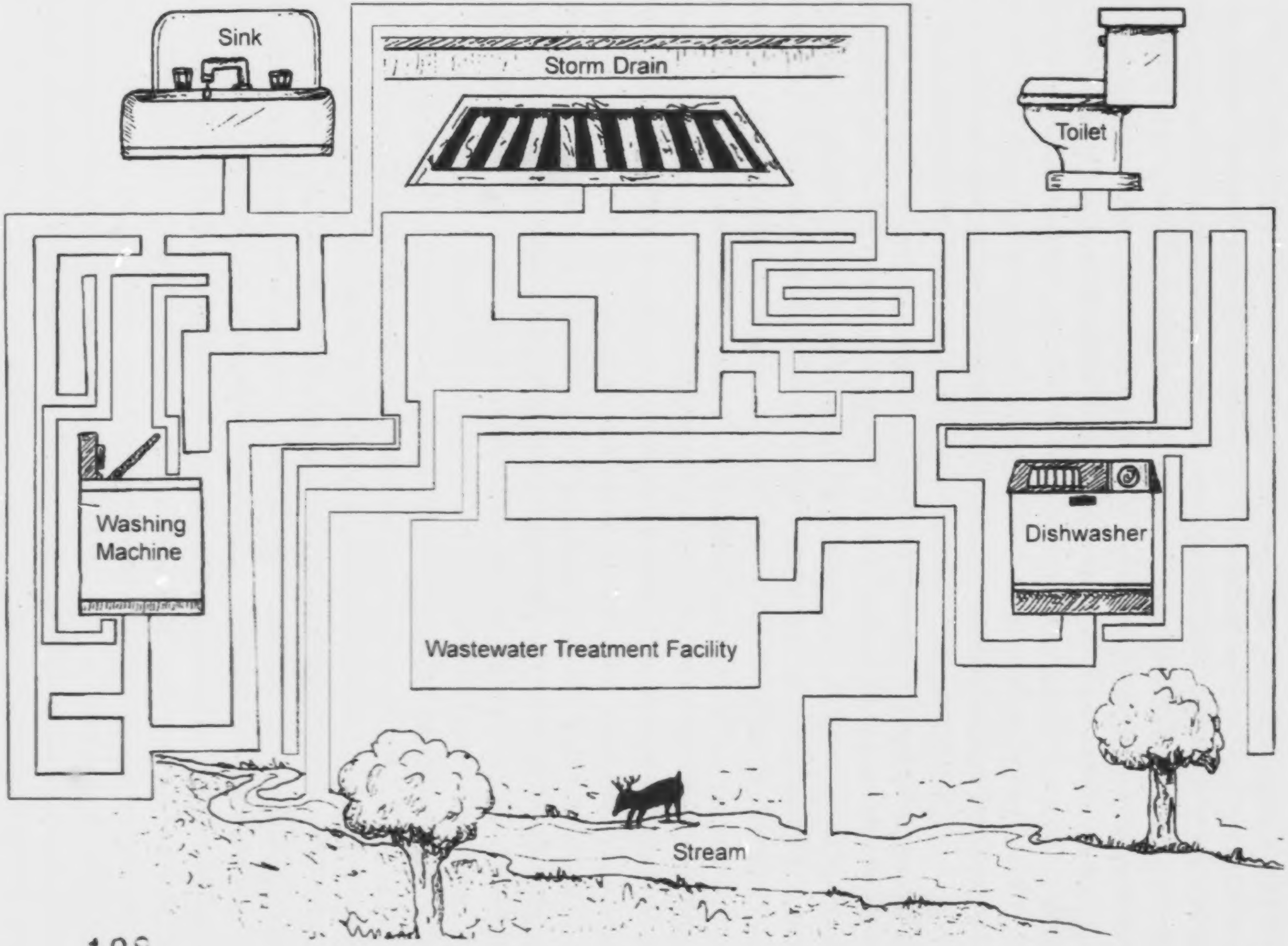


Images courtesy of California Integrated Waste Management Board

Worksheet: Sink to Stream

Student Name: ____________________

Draw a line from the sink to the stream. Using a different color for each, do the same with the toilet, the storm drain, the dishwasher, and the washing machine. Which one(s) go directly to the stream? Which one(s) go through a treatment facility?


Sink
Storm Drain
Toilet
Washing Machine
Dishwasher
Wastewater Treatment Facility
Stream

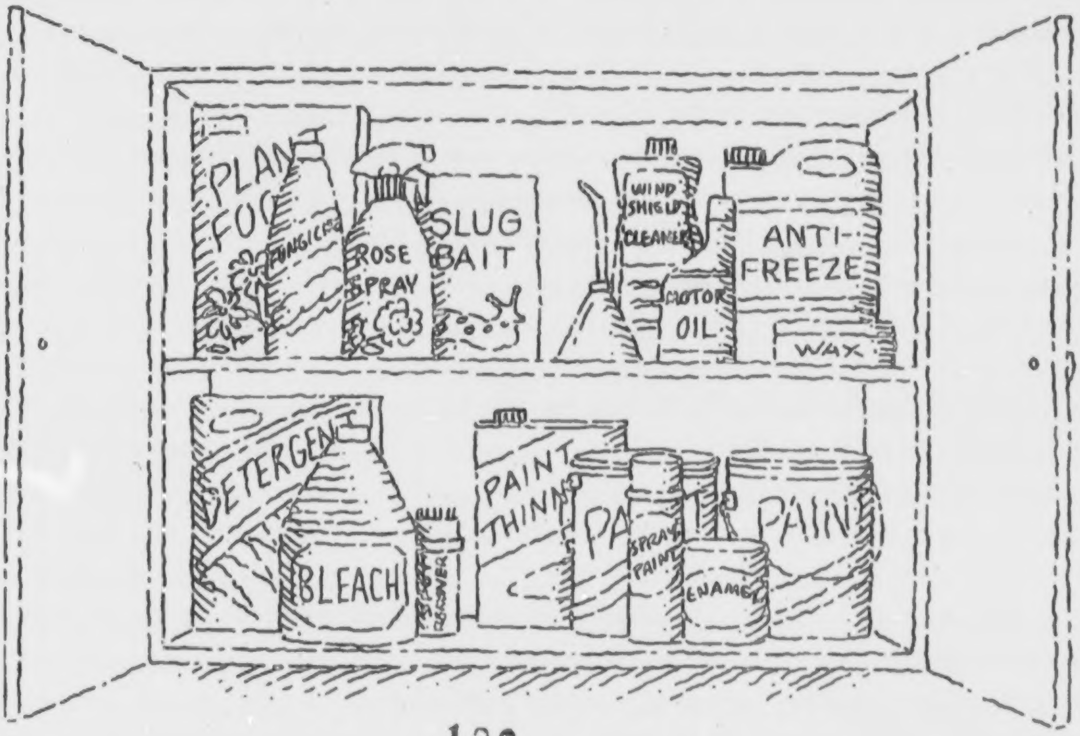
Handout: Tips for a Safer Home

Dear Parent:

Your child has recently been learning about products in the home that are potentially dangerous to people, wildlife and the environment if used or disposed of improperly. The following worksheet has some tips for dealing with chemicals in your home and will help you and your child identify products that should be used and disposed with care.

Safe Use and Disposal Tips

- Always buy the least toxic product necessary to do the job. Avoid products with the words CAUTION, WARNING, DANGER, or FLAMMABLE on the label.
- Buy the smallest container necessary to accomplish your task to avoid having left overs.
- Follow the instructions carefully and try to use up the product as intended or give left overs to someone else who can use it.
- Never pour hazardous products into storm drains or onto the ground.
- Don't mix hazardous chemicals or store them in unlabeled containers.
- Do take hazardous chemicals and cleaners to a household hazardous waste collection center or special collection event.
- Do take used motor oil to a service station or authorized dealers for recycling.
- Contact your local solid waste official to find out how to properly dispose of any questionable materials, if you are not aware of any special collection events or facilities in your area or call the HHW hotline for more information 1-800-732-9253 or 503-229-5913 in the Portland area.



Handout: Safe Substitutes Recipes

Air Freshener

A few cotton balls
Place a few drops of vanilla extract onto the cotton balls and set inside a cup or bowl
Good for the home, car, or refrigerator.

For unpleasant odors:
Boil 1 TBL of white vinegar in 1 cup of water.

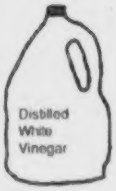
Drain Maintenance

1/2 cup of baking soda in the drain
Follow with 1/2 cup of vinegar
Cover and allow to sit for 15 minutes.
Rinse with 2 quarts of boiling water.
Do this regularly to keep drains fresh and to help prevent clogs.

BAKING
SODA

Glass Cleaner

1 quart of warm water
1/4 cup of white vinegar or 2 TBL of lemon juice
Mix and store in a spray bottle. Coffee filters make good glass cleaning rags and can be composted!



Vinyl Floor Cleaner

1 gallon of warm water
1/2 cup of white vinegar or 1/4 cup of borax
Mix in a bucket and mop as you normally would.

Moth Balls

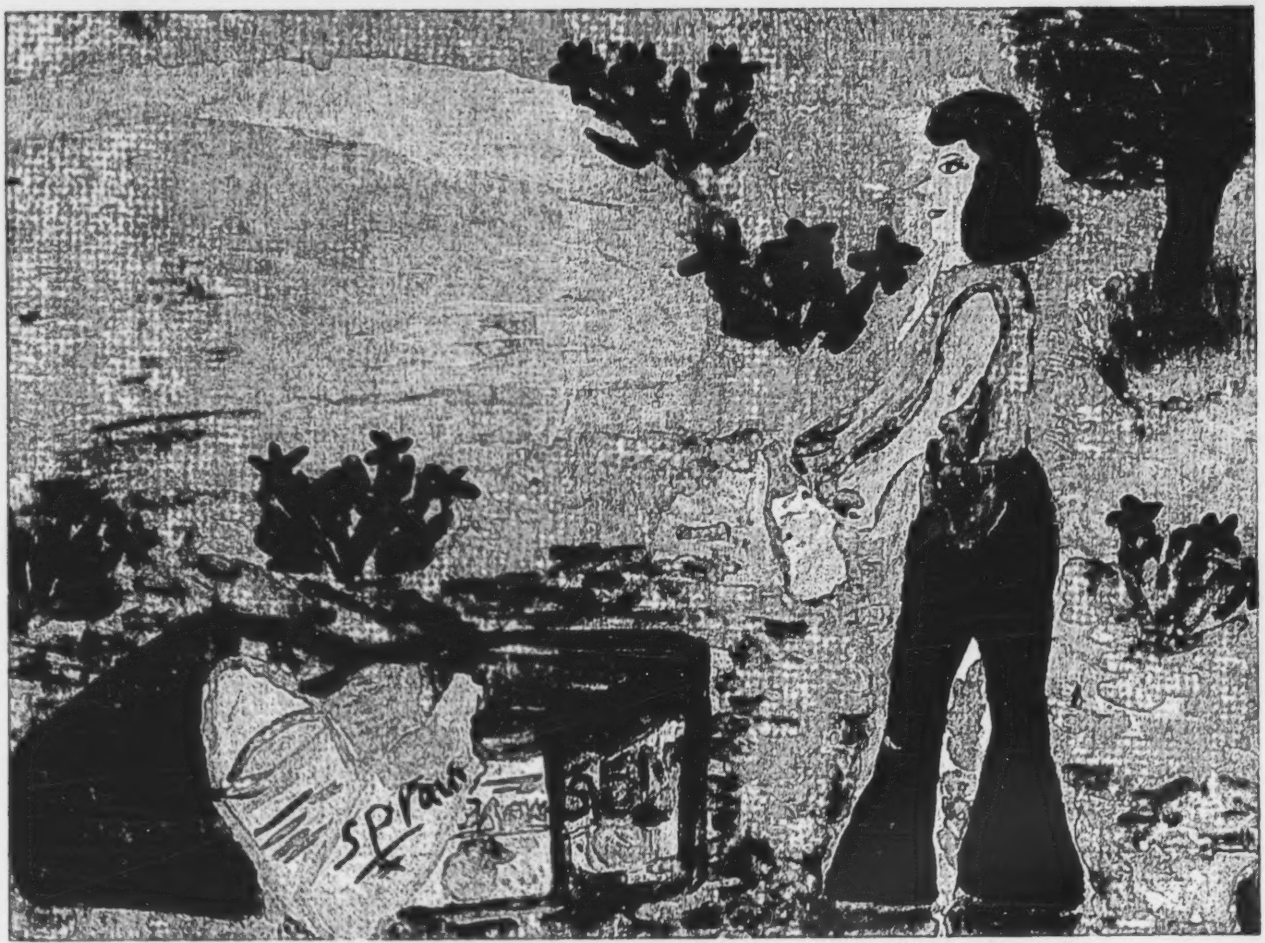
Store wools in sealed plastic bags or airtight containers.
Place garments in the freezer for several days to kill moths or larvae.
Vacuum rugs, carpet and upholstered furniture regularly.

Fertilizer

Amend your soil with a 2/3 soil to 1/3 compost ratio. This will add nutrients, help the soil retain water and keep plants hardy without the use of chemical fertilizers.

Slug Removal

Create slug traps with plastic food tubs. Cut several 1-inch square openings around the tub about 2-3 inches from the bottom. Place tub into the ground so that the openings are just above ground level. Fill tub with 1/2 inch of beer or yeast mixture and cover with lid. Empty every couple of days.
Yeast mixture: 2TBL flour, 1/2 tsp of baker's yeast, 1 tsp of sugar in 2 cups of warm water.



Student environmental artwork from Khabarovsk, Russia - Portland's sister city.

Overhead: Bicycle Materials, Wastes, and By-Products

Chromed and Plated Metal Parts

Materials

Chrome, nickel, copper, zinc

By-Products and Waste

(Highly toxic liquid wastes) Acids, chromium, zinc, copper, nickel, tin, cyanides

Handle Bar Grips, Plastic Seat Cover, Paint, Synthetic Fibers, Synthetic Rubber Tires

Materials

Petroleum and petroleum distillates

By-Products and Waste

Waste oil from leaks, caustic and acid sludge, alkaline and acid waters, acid gases and filtering clays

Frame and Other Metal Parts

Materials

Iron ore and coal to make steel

By-Products and Waste

Ammonia, tar, acids (pickling liquor), blast furnace flue dust

Paints and Coatings

Materials

Pigment, solvents, resins, cleaner

By-Products and Waste

Paints, solvents, cleaners

Fenders and Other Metal Parts

Materials

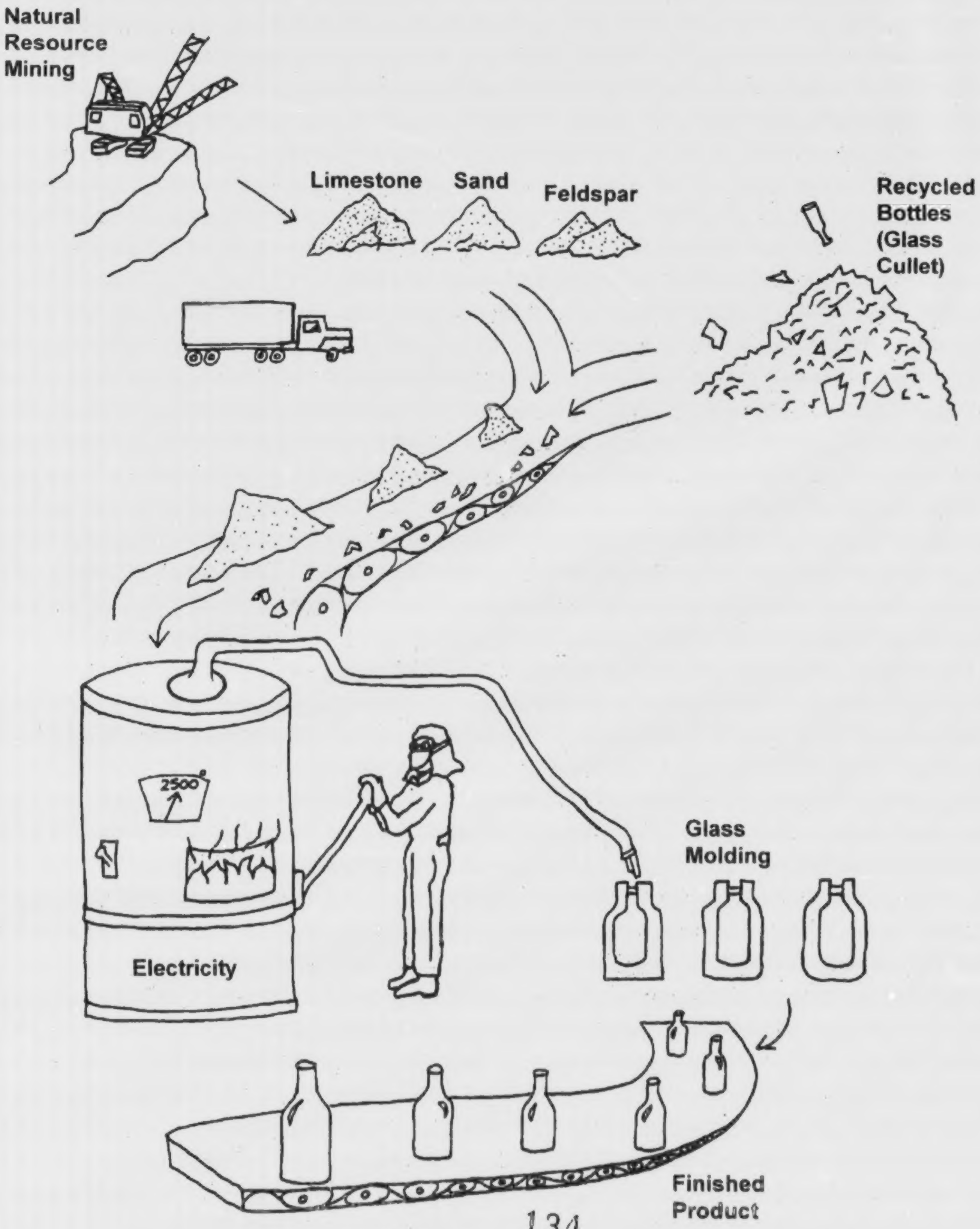
Aluminum (from bauxite)

By-Products and Waste

Large volumes of "Red Mud" consisting of iron, titanium and silica

Source: Washington Dept. of Ecology: *A-Way With Waste* (1990)

Overhead: Glass Manufacturing


Natural
Resource
Mining
Limestone
Sand
Feldspar
Recycled
Bottles
(Glass
Cullet)
2500°
Electricity
Glass
Molding
Finished
Product

Lesson: Our Natural Resources

Grade: 4-5
Subject: Science, Social Science
Objectives:
Students will:

- recognize that the earth is the source of everything we make, use, and throw away
- differentiate between natural resources and human-made items and their associated life cycles

Teaching Time: 45 minutes

Materials:
transparencies, Bicycle Materials, Wastes, and By-Products, Glass Manufacturing, Paper Production; worksheet: What Kind of Waste Am I?

(Optional:) rescued items from the trash (such as aluminum can, glass bottle, paper, plastic bag, fruit peel, etc.) video: Lifecycle of Paper and Glass (see Resource section for availability)

Vocabulary:

renewable

nonrenewable

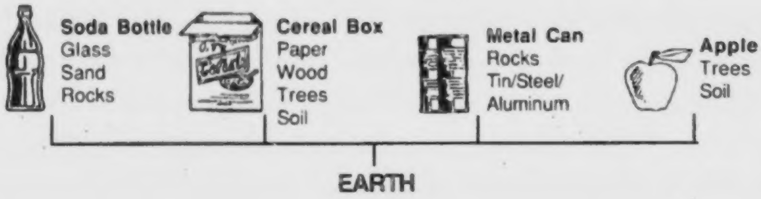
manufacture

production

REDUCE
REUSE
RECYCLE

Background:

This activity illustrates that the earth is the source of everything we make, use, and throw away. Natural resources are the raw materials supplied by nature. People cannot create natural resources. Even though we use natural resources in our daily life, we often do not think of them as being resources. Through the use of classifying skills, the different properties of natural and human-made objects will be reviewed. And by identifying the ways manufacturing and disposing of products alter the environment, students can better appreciate their personal role in conserving natural resources. For the discussion of the manufacturing and production transparencies in this lesson, teachers may want to review "The Recycling Process After Collection" in the resources section for more background information on specific materials.



Procedures:

- Show class an object from the trash. **What material is this made out of? Can you trace this material back to its source?** For example, a glass bottle is made from sand mixed with soda ash and lime, and melted down to form a liquid, which is then molded into glass.
- As you display and discuss more objects, copy the table above on the board. See if the children can trace the objects back to their origins.
- **Can you think of anything that you use that is not provided by the earth?** Students may name some things, but on close examination, students will realize that these things also come from the earth. (Use items from the trash as examples, if desired).
- Use the transparency/handout, "Bicycle Materials, Wastes, and By-Product" as another way to reinforce this concept.
- Using the manufacturing and production transparencies, discuss the process and resources used for making glass and paper.
- Identify where recycled materials can be substituted for raw materials thus saving natural resources.
- **Instead of a straight line to the landfill, how can the path be made into a continuous loop? By recycling (substituting used materials for raw materials).**
- **How else could fewer natural resources and less energy be used in manufacturing? By reducing use of products and by reusing old products.**

Reflection/Response:

- Relate the manufacturing, production and recycling of materials to natural cycles like seed-tree-decomposition-soil fertility-new tree. Help students understand that human cycles are not usually "complete" and are sometimes harmful to the environment. Ask students to name other examples of natural cycles and diagram them on the board.
- Assign the handout, "What Kind of Waste Am I?" Remind students of the difference between renewable and nonrenewable resources. (Nonrenewable resources cannot be replaced and are gone forever when used up and come from petroleum or natural gas originally.)

Extensions:

- Make a bulletin board display of natural resources and their origins in your class or school (see example page in the Resource section).
- Research the lifecycle of something. Ask students to draw or explain in writing or a flow chart, the lifecycle of an object that they use in their home. (This might be a type of food, or product or toy, etc.) Remind students to include transportation from the origin to the manufacturer to the store--and how they receive the item, etc. Encourage them to be as thorough as possible because each step uses energy, time, money and creates pollution along the way!
- Research the areas of the world where natural resources are mined and the how many reserves are known to exist. (Include minerals needed to make glass and metals like limestone, sand, feldspar, bauxite, iron, copper, nickel).
- Assign the Activity: Environmental Fortune Teller in the Resource section.

Oregon Common Curriculum Goal:

Science: Earth and Space Science, Unifying Concepts and Processes

- Understand the properties and limited availability of the materials which make up the Earth.
- Apply explanatory concepts of model, system, theory, probability, and replication

Social Science: Social Science Analysis

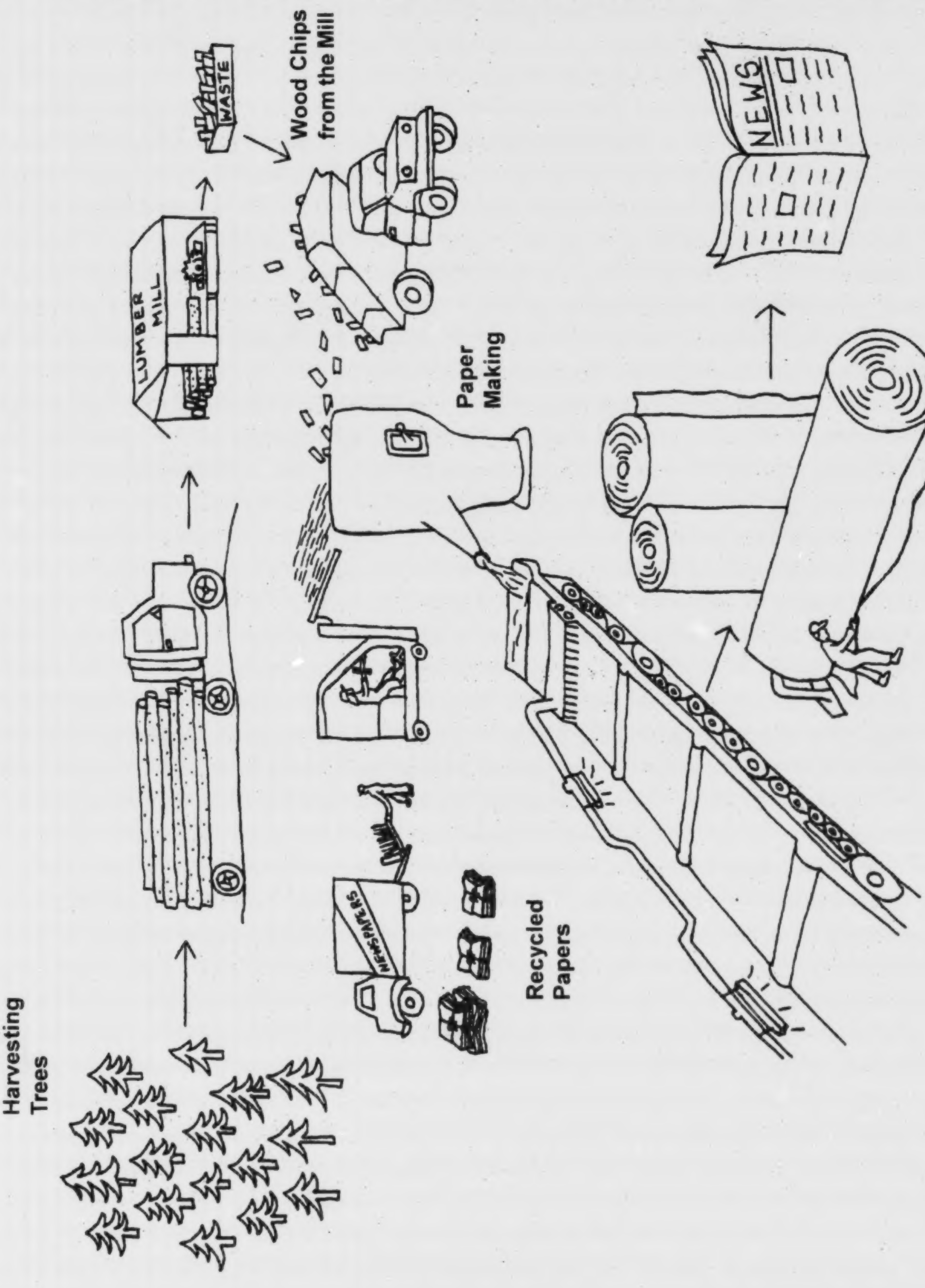
- Explain various perspectives on an event or issue and the reasoning behind them.

Grade 5 Benchmark:

Students will:

- Recognize that Earth materials have different physical and chemical properties that can be used in different ways such as for building materials, as sources of fuel, or as an environment for growing plants.
- Use models to explain how objects, events, and/or processes work in the real world.
- Identify and study two or more points of view on an event, issue, or problem.

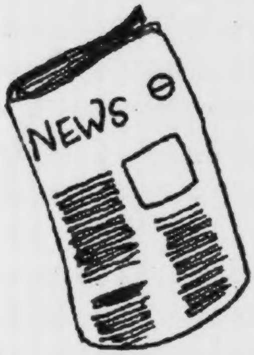
Overhead: Paper Manufacturing

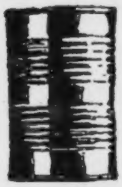

Harvesting Trees
LUMBER MILL
WASTE
Wood Chips from the Mill
Paper Making
NEWSPAPERS
Recycled Papers
NEWS

Worksheet: What Kind of Waste Am I?

Student Name:____

Match each object with the type of material that it originates from, note some may have more than one match. Also decide whether each object comes from a renewable or nonrenewable resource.





A. Tree/Plants

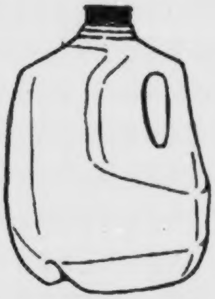
B. Rocks and Minerals

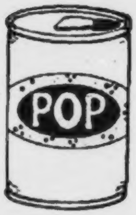
C. Animals

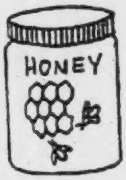
D. Oil or Natural Gas

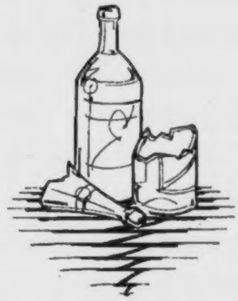
E. Nonrenewable

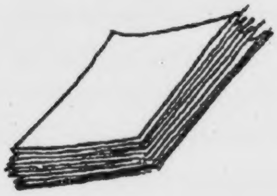
F. Renewable

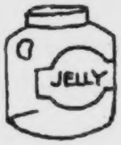


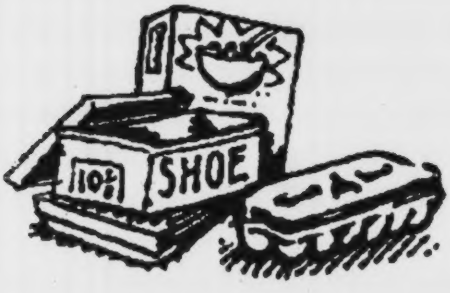


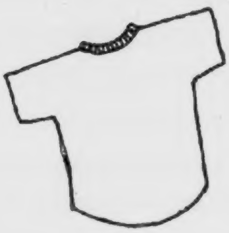












DEQ

Lesson: Native American Culture

Grade: 4-5
Subject: English, Social Science, Technology
Objectives:

- learn about Native American Culture and their relationships with the environment
- understand that people from various backgrounds and parts of the world can think differently about the world around them
- practice map reading

Teaching Time: Varied (depending on the teacher's overview of the subject)

Materials: handout: Native American Poetry and Pacific Northwest Native American Tales; worksheet, Native American Tales; transparency/handout, Oregon Tribes Map

(Optional:) handout: Native American Play "The Strongest One" (in the "Play" section of the Resources).

Vocabulary:
stewardship
culture

REDUCE
REUSE
RECYCLE

Background

In order to provide students some perspective on environmental issues, it is important to help them understand that people from other cultures and countries may think differently about the world around them. Americans from European descent brought their own values to the United States which resulted in densely populated cities, industrialization, and deforestation, for example. By viewing the environment as something that can be manipulated rather than something that can be coexisted with, we now live with many environmental problems. After going through this lesson, students should be able to appreciate that people have different cultural perspectives and that our own "cultural values" may have to be examined in order to protect the earth.

In order to discuss Native American themes concerning the environment, students should already have some historical context of early America, Native Americans and the first European settlers. This lesson could compliment your lessons about Lewis & Clark and the Oregon Trail, for example.

You may wish to focus more in depth on tribes in the Northwest or located within Oregon. A map of Oregon Tribes is included with the student worksheet and can also be used as an overhead for discussion. Additionally, there is a list of potential resources on NW tribes at the end of this lesson, for your convenience. You may also wish to read or teach from the books listed in the resource section under "Children's Books--Native American/Other Cultures."

The following is a partial list of Oregon tribes that you may want your class to study. Tribes marked with an asterisk no longer exist primarily due to diseases brought from settlers; changes in the environment such as mining, logging, or river damming; or reservation relocation.

Alsea*
Burns Paiute
Cayuse
Celilo Wy-um
Chastacosta*
Chinook
Clatsop*
Coos
Coquille
Cow Creek Band
Fort McDermott
Grand Ronde
Kalapuya
Klamath
Kuitsh*
Kwalhioqua*
Latgawa*
Lower Umpqua
Modocki
Molalla
Rogue River
Siletz
Siuslaw
Takelma*
Tillamook
Umatilla
Upper Umpqua
Walla Walla
Warm Springs
Wasco
Yoncalla

Procedure:

Assign the selections of Native American Poetry, Folk Tales, and the Play "The Strongest One" to members of the class to read aloud.

Reflection/Response:

DISCUSSION

- **In the Poem, "I Look at You", how does the author describe the way Native Americans value nature and the environment?**
- **What words or phrases does the author use to convey appreciation for the environment?**

- **What natural resources does she identify in the poem? (berries, rocks, trees, buffalo, etc.)**
- Discuss how you would feel if you lived in a society where you or your family made their own clothes, hunted and fished for their own food, and walked, rode horses, or took a canoe to get somewhere.
- **Can you name some types of pollution that would be lessened by living this way?** (List responses on the board--students should identify less air pollution from factories and cars, less chemicals from factories, less waste produced because people use the natural resources around them!)
- **Even though today, Native Americans and other U.S. citizens live in a "modern society" with electricity, cars, and lots of things for our homes and offices, can you think of some ways we can lessen our impact on the environment?** (List the responses on the board: examples include: riding a bike, recycling, reusing things, donating unwanted clothes, learning to take and buy only what we really need and thinking about the things we buy and how they impact the earth--natural resource extraction, transportation to market, etc.)
- **In the Poem, "The Wind Picks Up", what natural process is the title predicting will happen?**
- **Does the author feel good or bad about the rain storm? Why is her view of the rain positive, when most people think of the rain as negative? Which perspective or viewpoint is the "correct" one?**
- Discuss the ways in which people depend on natural resources such as wind, rain, plants, and animals in order to live.
- Native Americans have a long cultural history of coexisting with plants and animals, discuss how this is different from "modern society." Bring out ideas like: we raise certain animals on large farms to produce food like chicken, beef, milk and cheese instead of hunting for our food; and grow plants like corn and wheat on a large scale using pesticides and fertilizers, etc. Help students understand that while these changes have "modernized" society, they have also created much more pollution in the air, water and land that we have to deal with over the long term.
- **In the poem, "They Would Change the Rivers", who is the "they" in the title that the author refers to?**
- **What cultural difference between Native Americans and "white people" is the author trying to express in this poem? Is the tone of this poem positive or negative? Which words provide clues?**
- Assign the worksheet "Pacific Northwest Native American Tales."

(Optional)

- Perform the Play "The Strongest One."
- **What does this play make you think about?**
- **What are the relationships between the plants, animals and natural resources mentioned in the play?** (Lead the students to understand that life is a cycle and that all things are interconnected, for example plants need the sun to grow, animals eat the plants, people eat the animals, etc.)

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- **Why do you think that Native Americans tell folk stories to their children?** To help them gain a "sense of place", in other words to understand the environment in which they live and to learn to respect the natural things around them.
- **Why is it important to respect our surroundings and understand the relationships of nature?** Because we have to learn to coexist with the earth. For example, it is okay to use wood for our houses and for paper, but if we take too many, we are destroying the homes for animals in the wild. Also, if we cut too many trees in one area, rain makes the soil run into our rivers, lakes and streams which can kill the fish.
- Discuss the concept of "stewardship" and help students understand that no matter what our cultural values are, it is important to think of ourselves at stewards of the earth so that we can leave a happy, healthy environment for future generations.

Extensions:

- Have students write their own play or folk tale about something in the environment.
- Some subject examples include: Why do the seasons change?, Why does the sun rise and set?, Why do some animals come out only at night?, Why do salmon migrate from the river to the ocean and back?

Oregon Common Curriculum Goal:

English: Reading and Literature

- Recognize, pronounce and know the meaning of words in text.
- Demonstrate inferential comprehension of a variety of printed materials.
- Read a variety of literary forms of varying complexity from a variety of cultures and time periods.

Social Science: Geography

- Understand the spatial concepts of location, distance, direction, scale, movement, and region.

Technology: Technological Knowledge

- Understand that technology can be used to solve problems and meet needs.
- Assess the impacts and consequences of technology.

Grade 5 Benchmarks:

- Determine the meanings of words using contextual and structural clues, illustrations, and other reading strategies.
- Identify sequence of events, main ideas, facts, supporting details, and opinions in literary, informative, and practical selections.
- Analyze and evaluate information and form conclusions.
- Extend and deepen comprehension by relating text to other texts, experiences, issues and events.
- Read a variety of literary selections, including novels, short stories, poetry, plays, and nonfiction from a variety of cultures and time periods and identify characteristics of literary forms.
- Examine and prepare maps, charts, and other visual representations to locate places and interpret geographic information.

REDUCE
REUSE
RECYCLE

Resources to find information on Northwest Native American Tribes:

The First Oregonians. Eds. Baun, Carolyn M. and Richard Lewis. Portland: Oregon Council for the Humanities, 1991.

Beckham, Stephen Dow. *Native America in the Twentieth Century: An Encyclopedia.* Ed. Mary B. Davis. New York: Garland Publishing, 1994. *The Indians of Western Oregon: The Land Was Theirs. Coos Bay: Arago Books, 1977.*

Deloria, Vine, Jr. *Indians of the Pacific Northwest, From the Coming of White Man to the Present Day.* Garden City, NY: Doubleday, 1994.

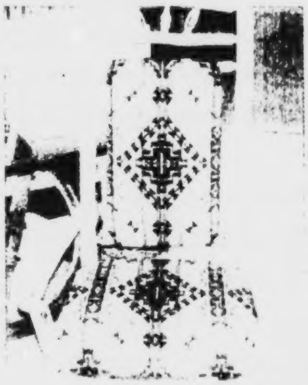
Gale Encyclopedia of Native American Tribes, Vol 10. Ed. Sharon Malinowski & Anna Sheets. Detroit: Gale Publishers, 1998.

Rafe, Martin. *The Boy Who Lived with the Seals.* (Chinook Legend). New York: G.P. Putnam's Sons, 1993.

Ruby, Robert H. and John A. Brown. *A Guide to Indian Tribes of the Pacific Northwest.* Norman: University of Oklahoma Press, 1992.

Seaburg, William R. and Jay Miller. *Handbook of North American Indians, Vol 7: Northwest Coast.* Ed. Wayne Suttles. Washington DC: Smithsonian Institution, 1990.

Trafzer, Clifford E. (Wyandot). *Chinook.* New York: Chelsea House Publishers, 1990.



Example of Native American furniture. Photo taken at the Confederated Tribes of the Umatilla Indian Reservation.

Internet sources:
- Chinook Tribe: *www.chinook-art.com*
- Cow Creek Band: *www.cowcreek.com*
- Grand Ronde: *www.grandronde.org*
- Klamath Tribes: *www.klamathtribes.org*
- National Museum of the American Indian: *www.nmai.si.edu*
- Siletz Tribes: *http://ctsi.nsn.us*
- Umatilla Tribes: *www.umatilla.nsn.us*
- Warm Springs Tribes: *www.warmsprings.com*

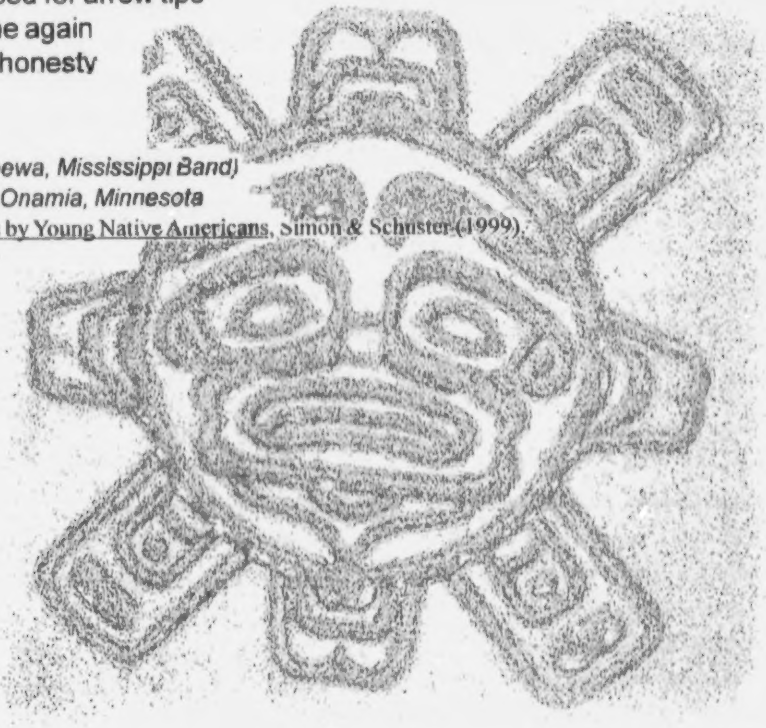
Handout: Native American Poetry

From the Objiwe People

I Look at You

I look at you and my mind drifts back to
    A time of peace and honesty
    A time of honor
    A time when all our people
        spoke our Native language
        and were proud to wear
        eagle feathers and beads.
    A time of dancing and giving thanks
        for all that Mother Earth
        gave our people:
        buffalo that roamed the grasslands
        fish that swam in clear blue rivers and lakes
        trees that our canoes were made from
        horses our people rode
        natural spring water pure and cool
        berries, roots, and bulbs, grown in rich soil
        rocks people used to tan hides
        stones our people used for arrow tips
Then I wish our people had that time again
        A time of peace and honesty
        A time of honor.

- Kelly Hill (White Earth Minnesota Chippewa, Mississippi Band)
Grade 10; age 16; Nay Ah Shing School, Onamia, Minnesota
Excerpted from: When the Rain Sings: Poems by Young Native Americans, Simon & Schuster (1999).

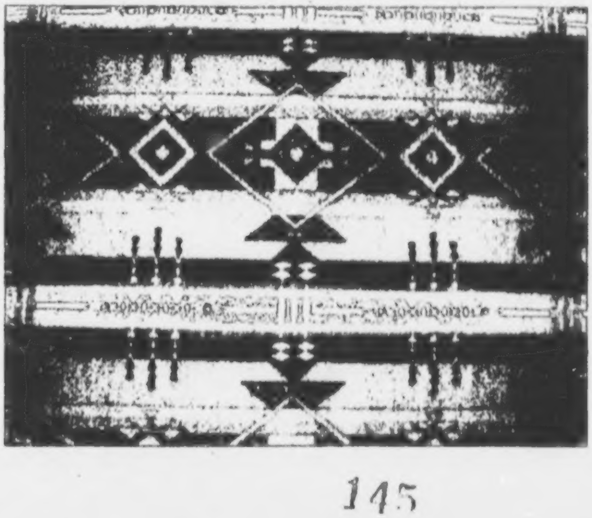


From the Tohono O'odham People

The Wind Picks Up

The wind picks up
the cold air blows
the clouds bring
the loud sound
of thunder and the
flashing lightning.
The animals go to
their homes
and the people come
out and enjoy the rain.
The smell of soil:
the rain falls just enough
to make a few puddles
then the rays of the sun
peek through the clouds
and the animals
come out and play
and soon
the sun is out
the puddles of water
and the sun create
a rainbow
that stretches across
the desert making even more beauty.

- Rayna Two Two (Tohono O'odham)
Grade 8; age 14; Baboquivari High School, Sells, Arizona
excerpted from: When the Rain Sings: Poems by Young Native Americans



Pacific Northwest Native American Tales

From the Tillamook People

South Wind and Frog

Water was very scarce at that time. There were no rivers, Frog alone had water which she kept in a basket water bucket. Anyone who wanted a drink of water had to go to Frog and ask for it. South Wind came to Frog; he said, "Auntie, I want a drink of water." "Confound it!" she said, "Everybody's drinking my water." She gave him a small drink, just a certain amount and no more. South Wind thought, "It is indeed terrible that there is no water. Water should be free." He left her and he hunted for a long rock that he could grasp in his hand. He watched for his opportunity; he hit her on the head. He knocked Frog senseless and South Wind took Frog's water; he emptied out that bucket; he threw water all around. He spoke, "That shall be rivers. All over the land there shall be rivers and creeks. Nobody shall own water, no one person."

Excerpted from Nehalem Tillamook Tales by Melville Jacobs. University of Oregon Books, Eugene, 1959.

From the Makah People

When the Birds and Animals were Created

When the world was very young, there were no people on the earth. There were no birds or animals, either. There was nothing but grass and sand and creatures that were neither animals nor people but had some of the traits of people and some of the traits of animals.

Then the two brothers of the Sun and the Moon came to the earth. Their names were Ho-ho-e-ap-bess, which means "The Two-Men-Who-Changed-Things." They came to make the earth ready for a new race of people, the Indians. The Two-Men-Who-Changed-Things called all the creatures to them. Some they changed to animals and birds. Some they changed to trees and smaller plants.

Among them was a bad thief. He was always stealing food from creatures who were fishermen and hunters. The Two-Men-Who-Changed-Things transformed him into Seal. They shortened his arms and tied his legs so that only his feet could move. Then they threw Seal into the Ocean and said to him, "Now you will have to catch your own fish if you are to have anything to eat."

One of the creatures was a great fisherman. He was always on the rocks or was wading with his long fishing spear. He kept it ready to thrust into some fish. He always wore a little cape, round and white over his shoulders. The Two-Men-Who-Changed-Things transformed him into Great Blue Heron. The cape became the white feathers around the neck of Great Blue Heron. The long fishing spear became his sharp pointed bill.

Photo by Gregory [illegible]

Another creature was both a fisherman and a thief. He had stolen a necklace of shells. The Two-Men-Who-Changed-Things transformed him into Kingfisher. The necklace of shells was turned into a ring of feathers around Kingfisher's neck. He is still a fisherman. He watches the water, and when he sees a fish, he dives headfirst with a splash into the water.

Two creatures had huge appetites. They devoured everything they could find. The Two-Men-Who-Changed-Things transformed one of them into Raven. They transformed his wife into Crow. Both Raven and Crow were given strong beaks so that they could tear their food. Raven new people would have fruit and could use the cherry bark for medicine.

A thin, tough creature they changed into the alder tree, so that the new people would have hard wood for their canoe paddles.

Thus the Two-Men-Who-Changed-Things got the world ready for the new people who were to come. They made the world as it was when the Indians lived in it.

Excerpted from a collection of Native American Legends on the internet: http://www.ilhawaii.net/~stony/loreindx.html

From the Umatilla people

THE BOY AND THE EAGLE [Hots-Wal ka Wap-tesh]

To the Indian, the eagle is held in high regard. The feathers are used in ceremonies and as part of some clothing. For instance, the feathers are attached to a staff and used like a flag.

This story is about a boy who saved the lives of young eagles and how the mother eagle helped. The boy had been fishing and was taking a short cut home when he was bitten by a rattlesnake. An eagle had been watching the snake. She flew down and killed the snake and took it to feed her young. At that time people and animals could talk to each other. The boy asked the eagle to help him. The eagle flew to a low marshy place and gathered medicinal grasses and seeds which the boy wrapped around the place where the bite was. Soon it healed enough so he could go on home.

One day the boy decided to go fishing again, and on his way home he met a group of bad boys who had a bunch of eagle feathers. He knew that they must have killed the parent eagles. He looked for them and found them both dead. He climbed the high bluff and found two young eagles who were much too young to go out and find food for themselves. He fed them the fish he had caught and made them comfortable.

Every day or so he would take them some food like snakes, mice, frogs, and fish. They grew fast and strong and were soon trying their wings for flight. Soon they were finding small animals to eat and flying further away from the nest. One day they were gone from the nest and never returned. Sometimes eagles would be seen flying high in the air.

Oh yes, there is a certain time of year when the eagles lose their feathers, so they would let the boy pick what he wanted.

Told by Esther Lewis
excerpted from the "Traditions" page on the Umatilla website: http://www.umatilla.nsn.us

Worksheet: Native American Tales

Student Name:____

1. Which of the three stories did you like the most, why?____________________

2. What is the theme or meaning that is common to all three stories?________________

3. Do you think that it is important to have respect for the environment and the animals that live there? Why or why not?____________________

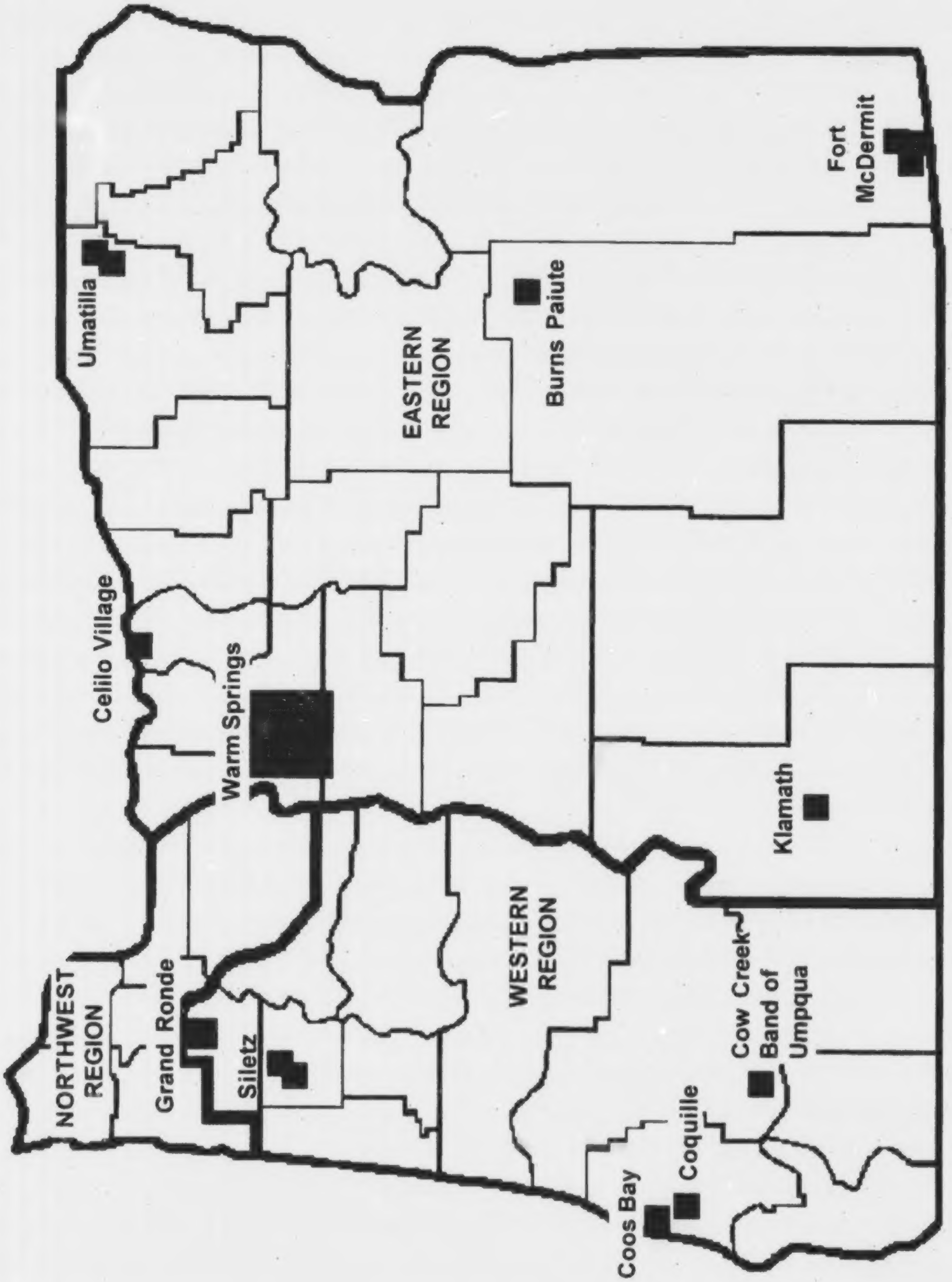
4. Name one thing that you have learned to appreciate about Native American culture from your readings and discussions.____________________

5. Look at the map of Oregon illustrating Native American Tribes.
Which tribe or tribes lives closest to you?____________________

6. Which tribes live on the northern border of Oregon?____________________

7. Which tribes live in the southern part of Oregon?____________________

Oregon Tribes Map


NORTHWEST REGION
WESTERN REGION
EASTERN REGION
Umatilla
Celilo Village
Warm Springs
Grand Ronde
Siletz
Burns Paiute
Fort McDermit
Klamath
Cow Creek Band of Umpqua
Coquille
Coos Bay

Lesson: Famous Environmentalists

Grade: 4-5

Subject: English, Social Science

Objectives:

Students will:

- learn some historical facts from an environmental perspective
- understand how over time, societal changes affected environmental discovery and preservation

Teaching Time: 1 hour

Materials: Handout: Famous Environmentalists Readings; worksheet, Famous Environmentalists

Background:

This activity presents a historical timeline of some of the most prominent environmentalists that lived in the United States. The readings offer a summary of the most notable accomplishments by each person. While covering this material, help students make the connection between the historical period in which the person lived, how society was evolving over time (from the late 18th century to today), and how these changes were often the catalyst for each environmentalists interests or discoveries.

Procedure:

- Today we are going to learn about some famous people who were all involved in environmental issues.
- Present a time line reference for students to help them put the accomplishments of each person into perspective. For example, the founding of America, the civil war, WW I and WW II, and any other relevant event that the students have already learned about.
- Read the biographies as a class or individually.

Reflection/Response:

- Discuss the implications of the readings and the importance of these accomplishments during the time the person was alive and their importance today.
- Have students complete the follow-up questions on their own.

Extensions:

- Have students pick other important environmentalists to report about or an environmental organization that they are interested in, either in writing or orally. You might suggest some of the following: Louis Gibbs, Marjorie Stoneman Douglas, Mardy Marie, Jacques Cousteau, Chico Mendes, or Ken Saro-Wiwa.
- Have students research and identify one environmental problem or issue that they would like to "solve" and why and present it to the class.

REDUCE
REUSE
RECYCLE

Oregon Common Curriculum Goal:

Social Science: History

- Relate Significant events and eras in United States and world history to past and present issues and developments. (U.S. History: Era 3 - Era 10).
- Interpret and reconstruct chronological relationships.

English: Reading and Writing

- Comprehend a variety of printed materials.
- Use writing as a tool to learn, reflect, and communicate for a variety of audiences and purposes.

Grade 5 Benchmarks:

- Understand how individuals changed or significantly influenced the course of U.S. history.
- Interpret data and chronological relationships presented in timelines and narratives.
- Analyze and evaluate information and form conclusions.
- Convey clear main ideas and supporting details in ways appropriate to topic, audience and purpose.

The Growth of Society

Audubon

John James Audubon, artist and writer, (1785-1851) was originally born in France, but he became an U.S. citizen in 1812. He is famous for his study of American birds and mammals. By 1839, Audubon had completed 435 paintings of birds that he sold as a collection of drawings and essays on bird habits. After being successful with the birds, Audubon eventually completed 155 mammal plates in 1948.

His writings are now considered a literary treasure and have significantly contributed to people's understanding and appreciation of these animals he wrote about. The first chapter of the Audubon Society was founded in 1896, which was named to honor John James Audubon. Today, the Audubon Society continues its work to protect wildlife and focuses largely on birds.

Thoreau

Henry David Thoreau, writer, (1817-1862) was not a naturalist, in fact he was suspicious of science. However, he made a lasting impact on society when he moved out into the country, to Walden Pond in Massachusetts, because of his desire to live simply. Thoreau's book *Walden,* which describes his life in the country and living in harmony with nature, earned him the title "Father of American Nature Writing".

He first made others aware of the idea that humans are part of nature and that we function best, as individuals and societies, when we are conscious of that fact. His quote, "a man is rich in proportion to the number of things that he can afford to let alone" warns us to be mindful of our impacts on the earth.

Conservationists

Muir

John Muir, scientist, (1838-1914), studied plants and rocks and is best known for founding the Sierra Club in 1892, probably the oldest preservation environmental group in the United States. As he put it, he wanted to "do something to make the mountains glad." The Sierra Club worked on preserving forests and other wild places in America. However, a couple of years before this, Muir had led a successful campaign to protect the area that is now Yosemite National Park in California. He also successfully convinced President Theodore Roosevelt to set aside more protected wildlife areas in the U.S. Roosevelt eventually protected 148 million acres of forests and created six new national parks.

REDUCE
REUSE
RECYCLE

Throughout his life, Muir encouraged people to orient themselves as part of nature. His quote, "When we try to pick out anything by itself, we find it hitched to everything in the universe" was another early warning to people to pay attention to our impacts on the earth.

Carver

George Washington Carver, scientist, (1864-1943) was born during the Civil War in Missouri on a slave farm. Carver worked tirelessly to obtain an education despite many obstacles that he had to overcome. Eventually he obtained two science degrees and focused on the study of plants and agriculture. Carver's work was critical to the way we think about managing our waste (trash) today. He did not believe in wasting materials and his research found hundreds of new uses for peanuts, sweet potatoes, pecans, soybeans and many other plants grown by farmers.

While living in the South, Carver noticed that certain crops like cotton would rapidly deplete the soil of its nutrients and make it very difficult to continue growing things in the future. He advocated the practice of composting in order to return plant materials back into the soil because many farmers hauled their plant waste away or burned it. Burning dead or harvested plants is wasteful because it releases valuable nutrients into the air instead of the soil. Also, the new found uses for many of the crops like peanuts and sweet potatoes meant that farmers could rotate the crops they planted each year which is also good for the soil. His discoveries are another example of how people have had to learn how to live in harmony with nature in order to preserve it for future generations.

Earth Advocates

Leopold

Aldo Leopold, writer, (1887-1948) is considered "The Father of Wildlife Ecology." He was a renowned author and worked as a forester. Marybeth Lorbiecki*, author of his biography, *Aldo Leopold: A Fierce Green Fire*, noted, "Multiple use [of forests] for him dealt with the multiple aspects of what a forest is -- trees, a habitat for game and songbirds, a place of adventure and respite for the human spirit, an anchor for the soil, and finally a community in which we are merely one member species. Wise use of this multifacted community then entailed many levels of response: respect, love, a search for greater scientific understanding, and careful, conservative use of the resources."
His famous book, *A Sand County Almanac,* discussed the idea that people and farmers needed to think carefully about how land, plants and animals work together as a system. Leopold tirelessly educated others on the need for a "land ethic" where plants and animals are not

just manipulated to fulfill human needs, but that they are treated in a manner that will preserve the overall health of the environment. His book has guided many to discovering what it means to live in harmony with the land and with one another.

Carson

Rachel Carson, scientist, (1907-1964) was a marine biologist who, for most of her life, worked for the U.S. Fish and Wildlife Service. Her most notable accomplishment was her book *Silent Spring* in which she described the connection between industrial society and the serious pollution problems that had developed in the United States. Carson wrote of the dangers of chemicals that were being used in many factories across the U.S. and the hazards being caused when the chemicals were dumped into the rivers and streams.

She identified the scientific process known as "bioaccumulation" that occurred from these chemicals. Bioaccumulation is what happens when a poison is released into the environment (like chemicals that are released or runoff into rivers), that poison is then absorbed by the soil, plants and animals living in the water. Then when the plant or animal is eaten by a bigger animal, the poison continues to exist inside the plant or animal and is transferred to the next animal as well. Over time, the animals at the top of the food chain (such as an eagle) get more and more poison inside their bodies. Because of Carson's work, scientists now know that certain chemicals (now illegal to use) had been released into the environment, had contaminated the fish that were eaten by Bald Eagles, and then caused the eagle's egg shells to be very soft and break. As a result, these chemicals were making the eagles go extinct because they could not have any more babies.

Rachel Carson's writings made it possible for scientists and environmentalists to think of ways to protect the eagles and the environment in the future. Sadly, she died of cancer at age 57 before she could see all the benefits of her work.

Chadwick

Alan Chadwick, (1909-1980) became famous for being an advocate of organic gardening. In 1967, Chadwick was hired to develop the garden at University of California, Santa Cruz. This garden, now known as the Chadwick Garden helped regenerate people's interest in organic gardening—a practice that had been largely abandoned for mass food production on large farms using fertilizers and pesticides.

REDUCE
REUSE
RECYCLE
RECYCLE

From this garden, his students have spread across the country with Chadwick inspired gardens and farms from California to Virginia—and even one in Kenya, Africa! His work was very important to help others understand natural ways to produce food without intensive fertilizers and pesticides. Organic gardening is important because it helps protect our surface and groundwater from chemical runoff and prevents human exposure to chemicals during the application and through bioaccumulation in the environment.

David Brower, (1912-2000) was an uncompromising environmentalist who contributed to the protection of many important natural areas during his lifetime. While working for the Sierra Club (founded in 1892 by John Muir), he opposed dam building that would have flooded the Grand Canyon in Arizona. Eventually he founded two other environmental organizations called Friends of the Earth and the Earth Island Institute.

Brower

Brower and the environmental organizations he founded and worked for were also able to successfully protect the Dinosaur National Monument in Utah; wilderness areas in the Northern Cascades, Oregon and Point Keyes, Washington; and the Everglades National Park in Florida and many more beautiful places in the United States.

Sources:
*From: A Leopold Biography: Interview With Marybeth Lorbiecki. On the About.com forestry web site at: http://forestry.about.com/science/forestry/library/weekly/aa010498.htm?pid=2820&cob=home

Definitions of terms used in this lesson:

Advocate: a person who speaks on behalf of something they believe in or care about

Composting: the process of turning food or other plants, such as leaves and grass, back into soil so that it can be used over again by plants that are growing

Environmentalist: a person who is interested in the environment and who acts to help take care of it

Ethic: the moral quality of a belief or action; a specific set of moral qualities demonstrated by an individual or a group

Industrial: referring to businesses and factories (places that make the things we use every day)

Natural resource: things from the earth that we use to get energy or make things out of such as trees, minerals, oil, natural gas, water, etc.

Naturalist: a person who believes in the science of nature or natural processes

Preservation: to make something last; to keep it around for as long as possible

Renowned: famous

Respite: a temporary rest or postponement from something

Species: a group of plants or animals that are classified together based on their common physical or genetic similarities

Uncompromising: unable to give in to the demands of someone else

Worksheet: Famous Environmentalists

Student Name:____

Questions:

1. Which famous environmentalist was most interesting to you? Why?____________________

2. Which person do you think was most helpful to society? Why?____________________

3. Who was known as the "Father of American Nature Writing?____________________

4. Describe what you think it means to have "land ethic" and name the other environmentalists that most likely also believed in land ethics.____________________

5. Explain what the famous quote "When we try to pick out anything by itself, we find it hitched to everything in the universe" means.____________________

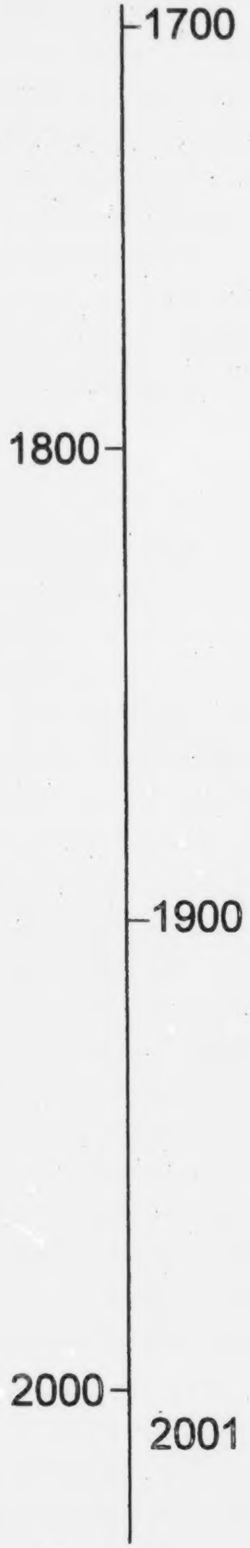
6. Make a list of the reasons you believe that it is beneficial to protect some natural areas in the United States like parks and mountains.____________________

7. Complete the timeline on the back of the worksheet showing when each person was born and when they died. Calculate their age when they died. Also note the dates of any major accomplishments that are listed.

8. (Optional) Write a report on someone in your city or county who works on environmental issues and share your information with the class.

Timeline: Famous Environmentalists

7. Complete the timeline.


1700
1800
1900
2000
2001

158

Lesson: There Is No Away

Grade: 4-5
Subject: English, Social Science, Writing (extension activity)
Objectives:
Students will

- recognize that there is no "away" in "throw it away"
- identify the destination of the waste they generate at home and at school
- identify the negative aspects of dumping or burning trash
- learn the "solid waste hierarchy" for managing our trash

Teaching Time: 40 minutes

Materials: transparency, Where Trash Goes and The Oregon Waste Hierarchy; poem, "Sarah Cynthia Sylvia Stout" by Shel Silverstein from *Where the Sidewalk Ends*; alternate reading: play, *Throwaway Three*; activity worksheet, Mining the Landfill.

REDUCE
REUSE
RECYCLE

Background:

Garbage, also called solid waste, is generated by people at home, at work, on vacation--well, everywhere! Most garbage is generated by businesses during the manufacture, processing and shipping of products. Although the exact percentage of the business waste in Oregon is hard to calculate, it is estimated to be about 60%. In 1999, Oregon disposed of 2.8 million tons of garbage. This is equivalent to 4.6 pounds of waste per person per day. Of this total, 92% was disposed of in sanitary landfills; the remainder was disposed of by incineration in Marion and Coos Counties* (these incinerators monitor burning with computerized pollution control devices to protect air quality).

An unknown amount of garbage is disposed by people illegally dumping their garbage in rural or abandoned areas and by burning their garbage in their fireplaces or on their property. Illegal dumping is punishable by a fine. The practice of burning or burning certain types of materials is illegal in some areas. (See the Burning Factsheet in the Teacher Resource section for more information). DEQ discourages burning anywhere because of certain hazards it poses. Burning is hazardous because it releases dangerous chemicals and metals into the air, often releases unpleasant odors into the neighborhood or community, but most importantly, burning poses serious health threats to people breathing the fumes.

Certain types of materials are banned from Oregon landfills and should not be placed in your garbage. (See the Landfill Bans Factsheet in the Resource section for more information). Hazardous or toxic materials that come from people's homes are discouraged from being placed in the garbage because they can injure solid waste workers and cause serious threats to the environment. Improper handling and disposal of hazardous substances can result in the release of "persistent bioaccumulative toxins" (PBTs) such as polychlorinated biphenyls (PCBs), mercury, and many pesticides, herbicides, and insecticides. Most PBTs are known or probable human carcinogens. The best way to deal with potentially hazardous substances is to use safer alternatives and use all of the product as it was intended, whenever possible. The following is a list of materials that should be disposed of at hazardous waste facilities or community special collection events whenever possible:

- pesticides, weed killer, moth balls, flea killers, herbicides
- pool/spa chemicals
- batteries--lead acid or nickel-cadmium types (contain acids and heavy metals)
- electrical equipment containing polychlorinated biphenyls (PCBs) such as older televisions, refrigerators, hydraulic fluid, or coolant liquids
- paints/solvents
- products containing mercury such as thermometers, thermostats, fluorescent light tubes
- harsh chemical cleaners such as bleach, oven cleaner, drain cleaner
- materials that are flammable, reactive, corrosive or toxic

*As we go to press Coos Bay Incinerator is still operating. However, it may close in the near future because of other solid waste management options that have become available to the area and that may be more cost effective.

Contact your local city or county Solid Waste or Public Works Department to find out how to properly dispose of potentially dangerous items in your area or call the Household Hazardous Waste Hotline 800-732-9253. (To follow up in more detail on hazardous items, use the lessons in the Hazardous Waste section). To learn more about priority PBTs go to: http://www.epa.gov/pbt/cheminfo.htm.

Fortunately, Oregonians are being educated to reduce, reuse, and recycle as much material as possible. In 1999, Oregonians recovered 37% of the total waste generated. Of these recovered materials, 66% was recycled, 19% was burned for fuel, and 15% was composted.

Procedure:

- Read and discuss the poem, "Sarah Cynthia Sylvia Stout" by Shel Silverstein or the Play: *Throwaway Three* by the Atlanta Clean City Commission. (In the Resource Section).
- **What do you think happened to Sylvia Stout? Why is it important to take the garbage out? Once it is out, where does it go?**
- **What do you think will happen if we don't find more effective ways to deal with our trash?** Discuss some of the historical and cultural differences brought up by the poem or play that lead people to treat items or materials in various ways.

For Both Readings:

- **How do you think trash is disposed? In Oregon, trash is usually landfilled and a small amount is burned at special factories or plants.**
- **Is it okay to dump your garbage out in open areas, ditches, ravines or forests? NO! Why not?** Students should conclude reasons like: it looks ugly, it can pollute the environment, or hurt animals or people that might come in contact with the garbage.
- **Does anyone's family burn garbage at home?** Explain to the students that fumes and gasses coming from a trash fire is unhealthy. Fumes can hurt your eyes and your lungs. Especially fumes from burning plastics. **Never, ever burn plastics!**
- Never get close to the fire or breathe the smoke! Point out that some chemicals cannot be seen or smelled, so it is not always obvious when something is harmful. Also, let them know that they should never set things on fire because it is bad for the air and for people and animals who breathe the polluted air.
- Show and discuss transparency, "Where Trash Goes."
- **What might happen if the landfill gets filled up? Where would we put the trash? Finding new land to build a new landfill is very expensive and difficult. No matter how careful we are, sometimes landfills still cause pollution after many years, so we need to keep using the ones we have as long as we can.**

- Discuss with students what they might do to create less waste. Students should mention things like: not taking or using more items than you need (like paper in class or napkins in the cafeteria), returning soda cans and bottles for deposits, recycling newspaper and plastic, repairing broken objects instead of buying new ones, giving used clothes to others, etc.
- Display the Solid Waste Hierarchy transparency.
- Oregon has a "waste hierarchy" for lessening the flow of waste to landfills. Teach students about "The 3 R's" (Reduce, Reuse, Recycle). We want people to Reduce first, Reuse everything you can, Recycle what is possible, then properly dispose of waste as a final option!

Reflection/Response:

- **What would happen if the garbage truck stopped coming?** Have younger students illustrate a story. Older students might write an imaginative essay about such a story.
- Have students complete the worksheet, Mining the Landfill.

Extension:

- Invite the school custodian to class and ask about his or her trash removing duties.
- Visit a landfill.
- Go on a virtual field trip to the Coffin Butte landfill in Oregon on the Internet by visiting their web site at http://www.cof.orst.edu/cof/teach/for365/tours/lf_tour/.

Common Curriculum Goals:

English: Reading

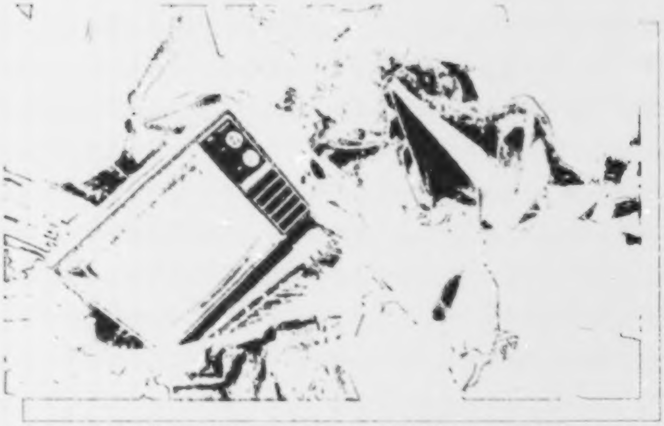
- Demonstrate literal comprehension of a variety of printed materials.

Social Science: Analysis

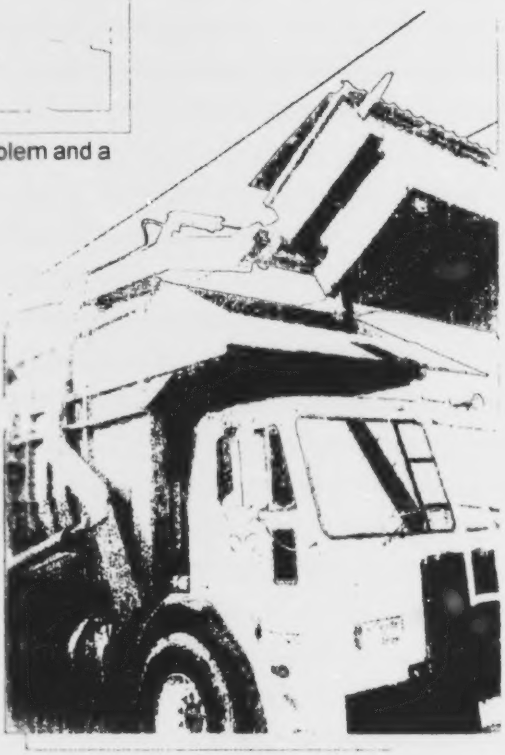
- Define and clarify and issue until its dimensions are well understood.

Grade 5 Benchmarks:

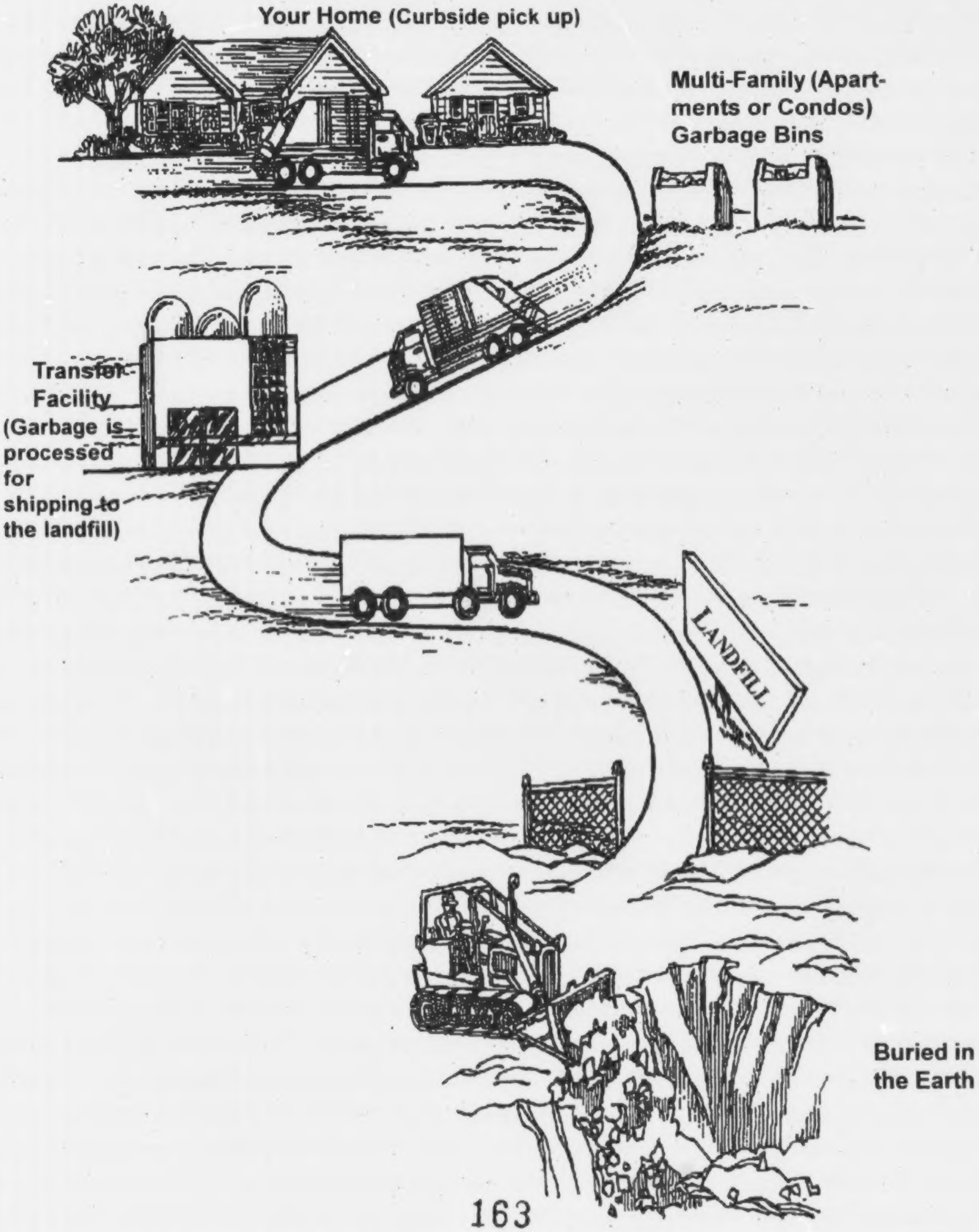
- Identify sequence of events, main ideas, facts, supporting details, and opinions in literary, informative, and practical selections.
- Identify an issue or problem that can be studied.
- Describe how peoples' lives are affected by the physical environment.



An example of modern society's growing trash problem and a garbage truck in action.

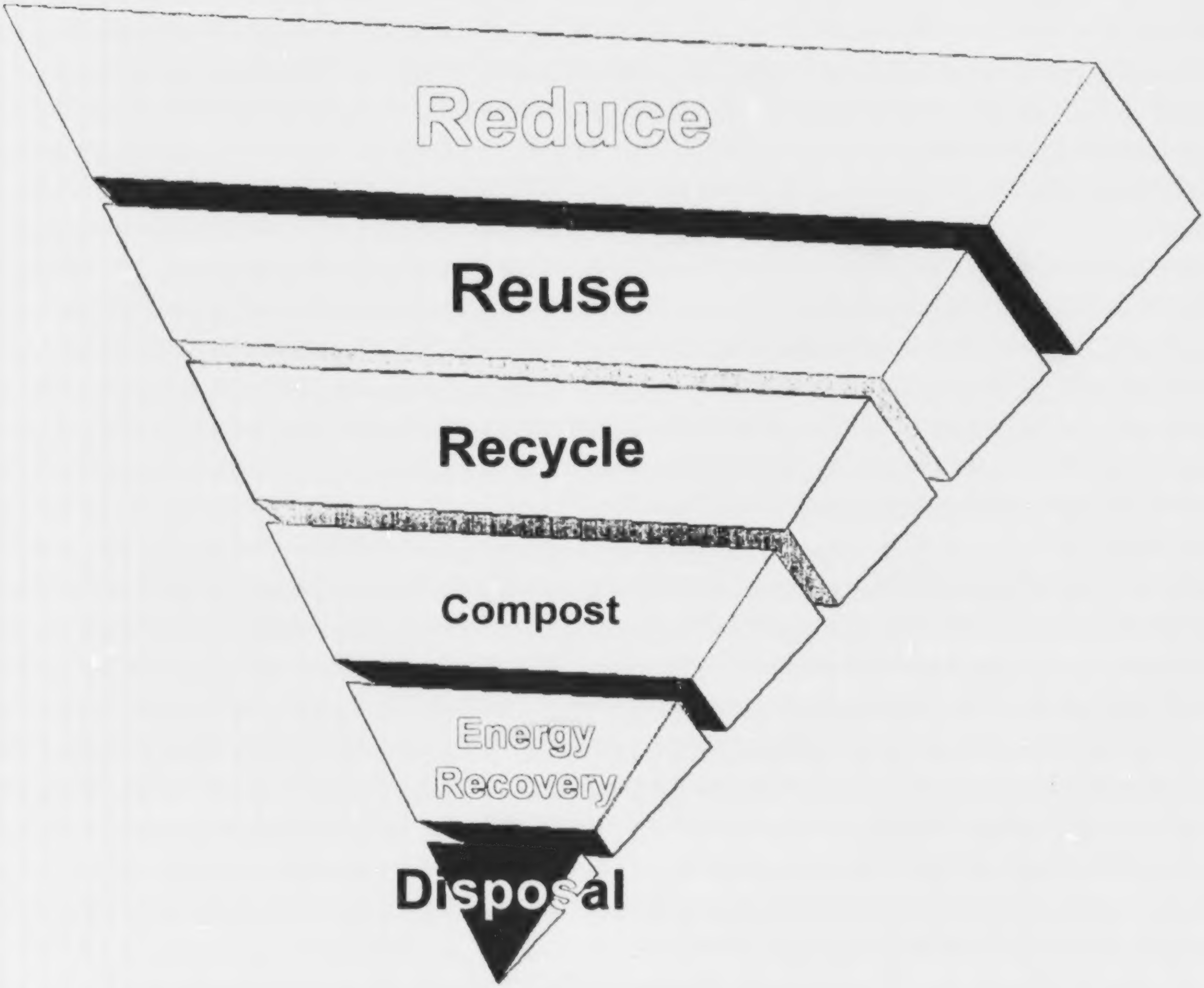


Overhead: Where Trash Goes


Your Home (Curbside pick up)
Multi-Family (Apartments or Condos) Garbage Bins
Transfer Facility (Garbage is processed for shipping to the landfill)
LANDFILL
Buried in the Earth

Source: South Carolina Department of Health and Environmental Control: *Action for a Cleaner Tomorrow* (1996)

Overhead: The Oregon Waste Hierarchy


Reduce
Reuse
Recycle
Compost
Energy Recovery
Disposal

How the Trash Pile Grows

Written by Betty Miles, *Save the Earth Ecology Handbook for Kids,* 1974.
Borrowed with permission from *A Way with Waste,* Washington Department of Ecology (1990).

Buy it, try it, throw the trash away!
Take it, break it, throw the trash away!
Get it, use it, finish it , lose it.
Wear it, tear it, throw the trash away!
Soda pop, box top, once you start you can't stop.
Buy it, show it, nothing left but to throw it!
Throw the trash away!
(Oh, no—where is "away"?)

Worksheet: Mining the Landfill

Student Name:____

Help! Some very valuable things are on their way to the landfill.

Save them from being thrown away. Circle in blue, the things that can be recycled. Circle in green, things you could reuse. Some items may be both! Be sure to look for:

newspaper
crayons
margarine tub
brush

tin cans
bottles
blank paper
motor oil

plastic bag
grocery bags
old toys
aluminum

cardboard
pencils
box
plates

jars
milk jugs
art paper
sock

Can you find some bonus words too? What do they tell you?____________________________________

____

S	O	C	K	Y	A	R	E	D	U	C	E	L	M	N	O	P
V	W	X	Y	Z	L	X	R	E	P	A	P	K	N	A	L	B
G	H	I	T	B	U	T	E	N	I	R	A	G	R	A	M	J
F	T	X	I	P	M	I	L	K	J	U	G	S	S	Q	R	S
L	P	E	N	C	I	L	S	C	O	L	D	T	O	Y	S	A
U	N	E	C	V	N	R	E	U	S	E	I	C	X	M	D	X
N	I	T	A	M	U	S	A	V	E	C	R	A	Y	O	N	S
C	E	B	N	C	M	A	B	C	B	N	Q	R	S	T	E	R
H	O	W	S	U	X	P	Q	A	T	O	M	D	R	O	G	E
B	A	R	S	Z	P	Y	G	B	S	I	X	B	L	R	A	C
A	R	E	L	P	L	R	M	R	O	T	B	O	X	O	B	Y
G	T	U	Z	J	A	R	S	U	P	U	O	A	K	I	R	C
S	P	S	K	R	T	P	K	S	M	L	T	R	D	L	A	L
F	A	E	L	M	E	P	E	H	O	L	T	D	M	L	G	E
R	P	X	Y	Z	S	O	P	R	C	O	L	D	O	N	T	M
O	E	C	Y	T	N	E	V	E	R	P	E	W	A	S	T	E
G	R	O	C	E	R	Y	B	A	G	S	S	E	R	O	X	J

Source: South Carolina Department of Health and Environmental Control: *Action for a Cleaner Tomorrow* (1996)

Teacher's Key: Mining the Landfill

Help! Some very valuable things are on their way to the landfill.

Save them from being thrown away. Circle in blue, the things that can be recycled. Circle in green, things you could reuse. Some items may be both! Be sure to look for:

- newspaper
- crayons
- margarine tub
- brush
- tin cans
- bottles
- blank paper
- motor oil
- plastic bag
- grocery bags
- old toys
- aluminum
- cardboard
- pencils
- box
- plates
- jars
- milk jugs
- art paper
- sock

Can you find some bonus words too? What do they tell you? COMPOST GARBAGE,

REDUCE, REUSE, RECYCLE, PREVENT WASTE & POLLUTION, SAVE LUNCHBAGS

S	O	C	K	Y	A	R	E	D	U	C	E	L	M	N	O	P
V	W	X	Y	Z	L	X	R	E	P	A	P	K	N	A	L	B
G	H	I	T	B	U	T	E	N	I	R	A	G	R	A	M	J
F	T	X	I	P	M	I	L	K	J	U	G	S	S	Q	R	S
L	P	E	N	C	I	L	S	C	O	L	D	T	O	Y	S	A
U	N	E	C	V	N	R	E	U	S	E	I	C	X	M	D	X
N	I	T	A	M	U	S	A	V	E	C	R	A	Y	O	N	S
C	E	B	N	C	M	A	B	C	B	N	Q	R	S	T	E	R
H	O	W	S	U	X	P	Q	A	T	O	M	D	R	O	G	E
B	A	R	S	Z	P	Y	G	B	S	I	X	B	L	R	A	C
A	R	E	L	P	L	R	M	R	O	T	B	O	X	O	B	Y
G	T	U	Z	J	A	R	S	U	P	U	O	A	K	I	R	C
S	P	S	K	R	T	P	K	S	M	L	T	R	D	L	A	L
F	A	E	L	M	E	P	E	H	O	L	T	D	M	L	G	E
R	P	X	Y	Z	S	O	P	R	C	O	L	D	O	N	T	M
O	E	C	Y	T	N	E	V	E	R	P	E	W	A	S	T	E
G	R	O	C	E	R	Y	B	A	G	S	S	E	R	O	X	J

Lesson: Making A Model Landfill

Grade: 4-5
Subject: Science
Objectives:
Students will:

- construct a model of a landfill and analyze the most effective design
- identify the way in which a landfill is different than a natural cycle
- identify the pros and cons of landfill disposal and alternative forms of disposal
- practice map reading

Teaching Time: 50-60 minutes

Materials: Instructions, Making a Model Landfill; worksheet, Layers of a Landfill in a Bottle; transparency, Construction of a Landfill in a Bottle and Diagram of a Landfill

(Optional:) Video: "Time's a Wasting: Garbage and Recycling in Oregon" (see the Resource section for availability)

Background:

(Prerequisite: Our Natural Resources). Almost all garbage is eventually disposed of in a landfill. (See "There is No Away" Background for more detail). As of 2001, there are 36 active municipal solid waste landfills in Oregon. Some, but not all, of these landfills have upgraded modern systems that maximize environmental protection. "Modern" landfills (all landfills or sections (called cells) of landfills built after 1991) are called sanitary landfills because they are lined with a thick plastic and clay layers and have leak monitoring systems in order to protect our groundwater. Older unlined landfills continue to be a source of environmental pollution that we must pay to clean up until they no longer exist.

According to federal law, all closed landfills must be monitored for 30 years. Landfills are monitored for two reasons. First, to control methane buildup which can cause fires and explosions and second, to control "leachate" which can leak out. With regard to the first issue, the technology has now developed so that we can "harvest" the excess methane from large landfills and actually use it as a source of energy. However, this is still not a very efficient process and is still not being widely used, but it may be important for future energy conservation efforts.

The second issue, controlling leachate, is very difficult and complex. Leachate is any liquid that comes into contact with garbage and commonly contains undesirable components such as volatile organic compounds (VOCs), nitrates, trace metals, and other salt compounds. Additionally, the pH of leachate is usually corrosive, so when it migrates through the soil it can remove naturally occurring iron and manganese which can pollute surface and groundwater.

Leachate is dealt with by two primary approaches. The first approach to dealing with the problem of leachate is to keep the landfill as protected and dry as possible so that excess leachate is not formed. In Oregon this is how it is handled. This means that garbage is not receiving much air or water and will not break down for an unknown period of time, possibly hundreds of years or more. Modern landfills with leachate monitoring systems will test the leachate for presence of hazardous constituents. If the leachate is not hazardous, it is removed and sent to the waste water treatment facility. Hazardous leachate is processed the same as any other hazardous waste.

The second method for dealing with leachate is being tried in other parts of the U.S. This method involves the "recirculation" of the leachate and air through the landfill in order to speed up the decomposition of garbage. This method tries to deal with any problems stemming from the decomposition such as toxins or methane right away while the landfill is still open and being actively monitored. There are critics of both methods for dealing with landfilled waste and the "best" method has not been agreed upon.

Procedures:

- **Where does all waste end up? In Oregon, unless recycled, 92% of our waste goes to a landfill, the rest is disposed of by incineration which is a special type of burning done by experts.**
- In a landfill, each day's trash is covered with a layer of dirt to control rodents, odor, and scavenging birds. Landfills are lined with a thick plastic liner and clay to keep liquid from the garbage from leaking into the ground. This liquid is called 'leachate'. Write the word on the board.
- **Today we are going to build different models of landfills and study their effectiveness.**
- Teacher may choose to have small groups of students each build a model of one type of landfill, or do as a demonstration lesson, using student-helpers to build the models before the whole group.
- Follow the procedures as listed on the instruction sheet.
- Display the transparency, "Diagram of A Landfill." Have class note similarities and differences in their models and the real thing.

To demonstrate the models:

Have students write a hypothesis about which model will best protect the groundwater.

Mix the water with some food coloring to represent the "leachate" that rain will pick up as it runs through the garbage. Carefully pour the leachate over each model. Be sure not to oversaturate the lined landfill model or the liner will not be able to protect the groundwater! (But you may want to continue adding water to the lined model to demonstrate how sometimes landfill liners fail and some pollution can still leak into the groundwater.) *If the bottles become too full of water, simply unscrew the cap at the bottom of the landfill to drain the water into the base or into a sink.

Reflection/Response:

- Have students record the changes in groundwater in their journals or on data sheets. Students should note problems they can see with open dumps compared to a sanitary landfill. (They should record things like smell, will attract animals and flies, is very unsightly, windblown trash will become litter, etc.)
- Have the class brainstorm the pros and cons of placing waste in landfills. Pros might include: the garbage needs to go somewhere, landfills can handle large amounts of waste, landfills keep waste away from where people live, landfills keep other places waste-free, landfills can be designed to protect the environment, and are sometimes converted into "green spaces" after closed. Cons might include: landfills take up space making it impossible for people and wildlife to use the land, landfills are ugly, they can create unpleasant odor and attract pests, things that end up in landfills are usually no longer available for people to use and sometimes landfills leak into our groundwater supply.
- Have students explain how a landfill violates the principal of a natural cycle. (Light and air are not available inside a landfill and very little moisture is allowed inside, so natural decomposition cannot occur).

- Have students develop a list of alternatives to placing things in the landfill individually or as teams. (Students should be encouraged to think BIG--for example, instead of throwing away an old item it could be donated somewhere where it would be reused, or instead of throwing a product away, the company that made it would agree to take it back and use its parts to make a new item, or organic material would be composted).

Extensions:

- Ask students to draw and label a model of a sanitary landfill.
- Go on a field trip to a local landfill or tour the Coffin Butte Landfill on the web at: http://www.cof.orst.edu/cof/teach/for365/tours/lf_tour/
- Show the video, "Times A Wasting".
- Ask a landfill coordinator or local trash hauler to speak to your class about how local garbage is handled. (See Field Trip Guide for opportunities in your area).

Oregon Common Curriculum Goal:

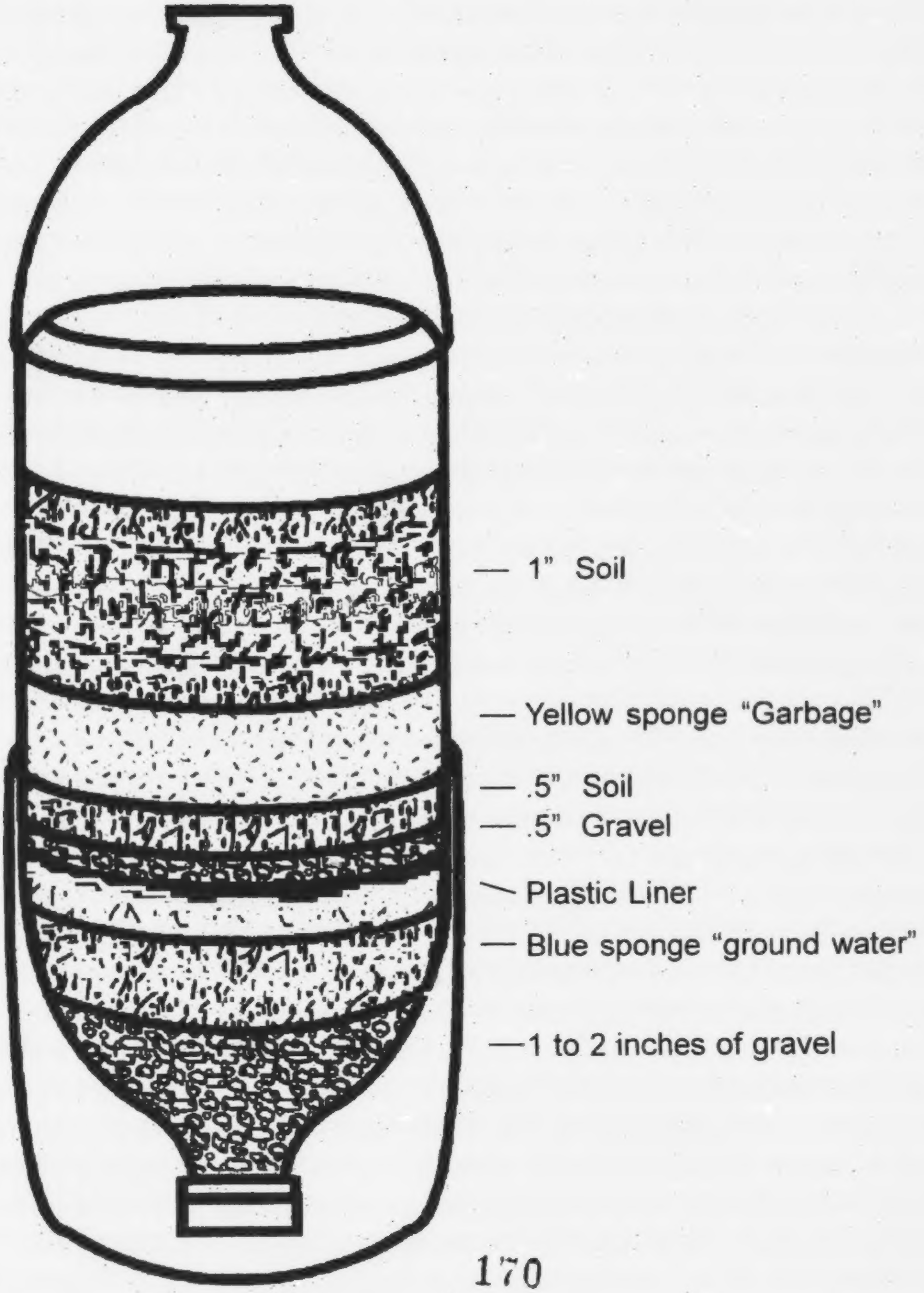
Science: Unifying Concepts and Processes

- Apply explanatory concepts of model, system, theory, probability, and replication.

Grade 5 Benchmark:

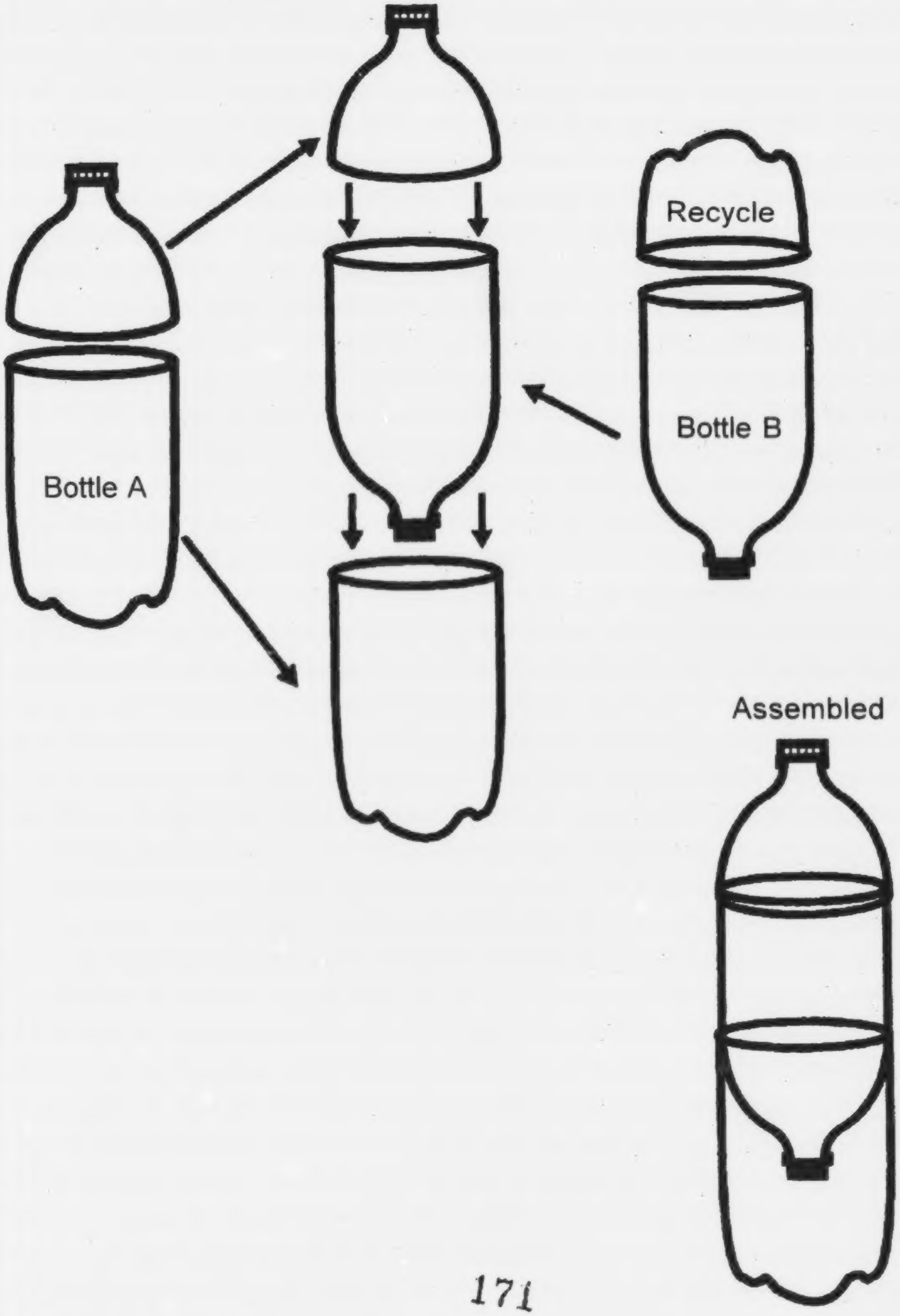
- Use models to explain how objects, events, and/or processes work in the real world.

Example of a Lined Landfill Model


— 1" Soil
— Yellow sponge "Garbage"
— .5" Soil
— .5" Gravel
Plastic Liner
— Blue sponge "ground water"
—1 to 2 inches of gravel

Source: California Integrated Waste Management Board: *Closing the Loop: Exploring Integrated Waste Management and Resource Conservation K-6* (2000)

Overhead: Construction of a Landfill in a Bottle


Recycle
Bottle B
Bottle A
Assembled

Source: California Integrated Waste Management Board: *Closing the Loop: Exploring Integrated Waste Management and Resource Conservation K-6* (2000)

Making a Model Landfill Instruction Sheet

Materials:

- 3 two-liter bottles (peel off the labels)
- 3 blue sponges cut into the shape of the bottle
- 2 yellow sponges cut into the shape of the bottle
- A plastic grocery bag or plastic film
- 6 cups of potting soil
- 3 cups of rocks or aquarium gravel
- Red or green food coloring
- 3 cups of water

Open Dump

Place the bottle top into the base. Place the gravel into the bottom. Place a blue sponge on top of the gravel to represent the groundwater. Fill the bottle with potting soil and place some "garbage" into and on top of the soil. (Students can use paper scraps, small food scraps, paper clips, etc. to represent the garbage). Be sure to place most of the garbage near or on the surface of the model.

**Placing the tops of the 2-liter bottles on top of the models is optional.*

Unlined Landfill

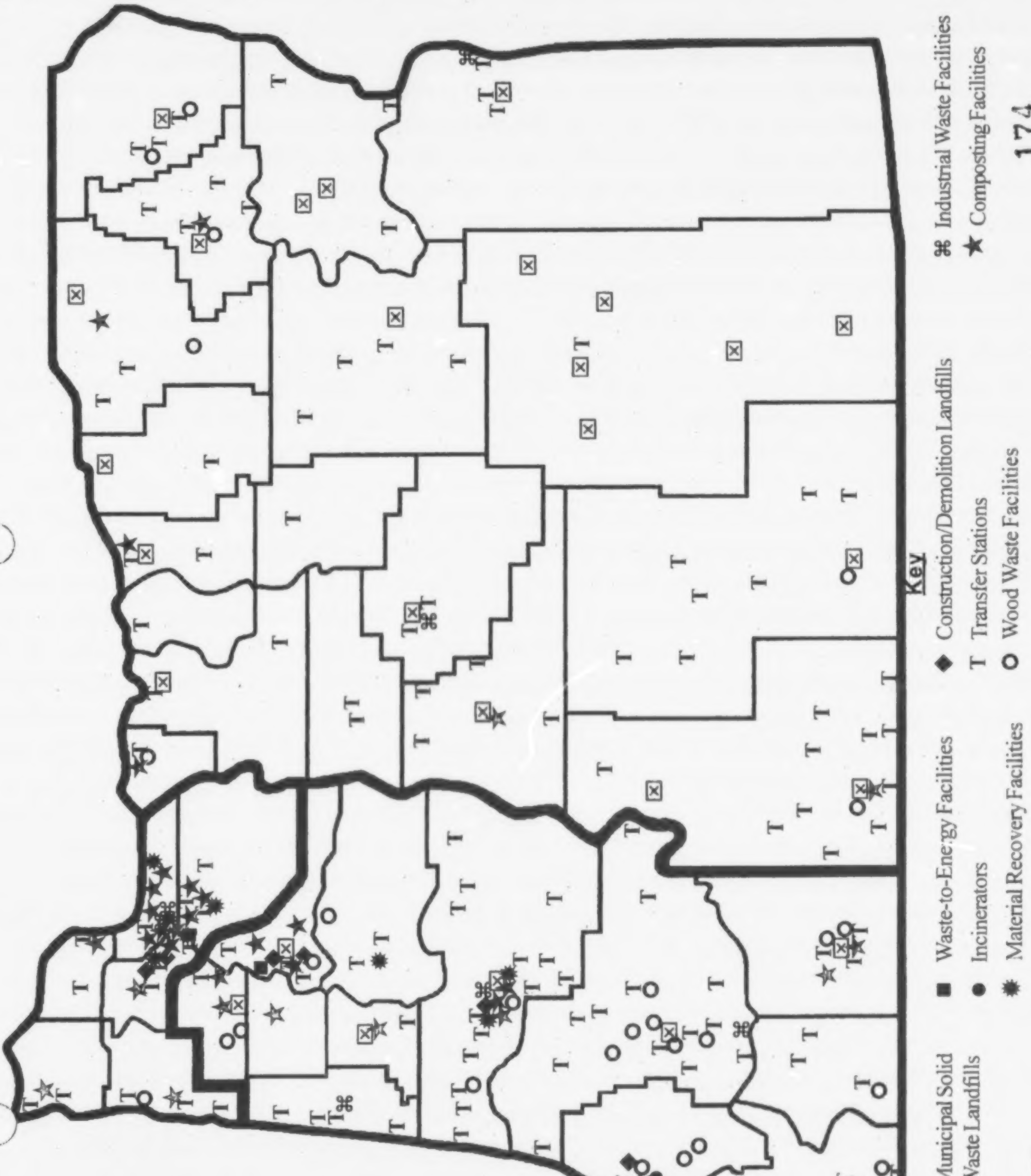
Place the bottle top into the base. Place the gravel into the bottom. Place a blue sponge on top of the gravel to represent the groundwater. Add 2 inches of soil and top with a yellow sponge to represent the garbage. Cover to the top of the model with soil.

Lined Landfill

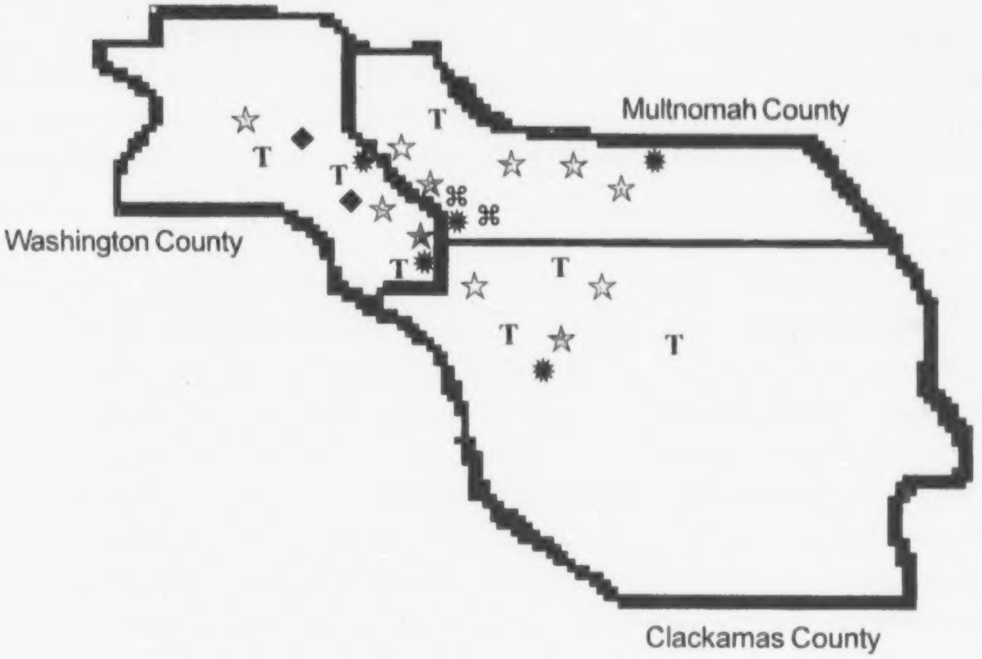
Place the bottle top into the base. Place the gravel into the bottom. Place a blue sponge on top of the gravel to represent the groundwater. Add a plastic bag that is carefully cut to the shape of the bottle so that it completely covers the surface. Add about half an inch of gravel on top of the plastic. Add about half an inch of soil, then top with the yellow sponge to represent the garbage. Then fill the model to the top with soil.

A leachate monitoring system at the Knott Pit Landfill in Bend, Oregon.

Handout: Active Facilities in Oregon (as of October 2000)


Key
☒ Municipal Solid Waste Landfills
■ Waste-to-Energy Facilities
● Incinerators
✸ Material Recovery Facilities
◆ Construction/Demolition Landfills
T Transfer Stations
○ Wood Waste Facilities
⌘ Industrial Waste Facilities
★ Composting Facilities

Handout: Active Facilities in Metro Area (Enlarged View)


Multnomah County
Washington County
Clackamas County
T
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Key

- ◆ Construction/Demolition Landfills
- ✹ Material Recovery Facilities
- T Transfer Stations
- ⌘ Industrial Waste Facilities
- ☆ Composting Facilities

Map Exercise: Making a Model Landfill

Student Name:____

Study the Active Facilities in Oregon map and answer the following questions.

Definitions of the terms described on the map:

Composting Facilities: Places that collect yard debris or "green waste" such as leaves, grass, small branches, weeds, etc.

Construction/Demolition (C&D) Landfills: Places that only accept waste that is generated from creating new buildings, houses, roads, or waste from tearing down buildings, houses, etc. This waste contains materials such as concrete, dry wall, wood pieces, paneling, ceramic tile, etc.

Incinerators: Places specially constructed for burning garbage that is generated by us at home instead of landfilling it. Hazardous materials cannot be sent to an incinerator or a landfill. These facilities have special equipment to help keep pollution out of the air. Once the garbage is burned, there is a waste by-product called "ash" which can be hazardous. This ash must be disposed of at a special type of landfill.

Industrial Waste Facilities: Places that take waste created by factories and other types of businesses. This waste is usually the by-product created from making some type of product and often contains various types of chemicals.

Material Recovery Facilities (MRF): Places that take waste from people or from businesses. The garbage is then sorted through to recover materials that can be recycled such as metal, glass, wood, etc. and the rest is sent to a landfill or incinerator.

Municipal Solid Waste (MSW) Landfills: Places that take the garbage generated by us at home. This waste can be made of all types of materials that we throw away. However, MSWs do not take any materials that are considered hazardous. The by-products from landfills are methane and "leachate". Leachate is the liquid that comes from the trash and mixes with rainwater. Leachate and methane can be dangerous to people and to the environment.

Transfer Stations: Places where small garbage trucks drop off trash that is later compacted into metal containers so that it can be carried to the landfill in larger trucks. This means that more garbage is carried by a single truck which is more efficient for transporting materials.

Waste-to-Energy (WTE) Facilities: Places where garbage is burned and the heat is captured and converted into electrical energy that can then be used to power our homes, schools, and offices.

Wood Waste Facilities: Places that collect large pieces of wood materials, such as tree stumps, that have been removed and also construction wood when buildings are torn down. Wood that has not been treated with chemicals is often "chipped" or "mulched" into small pieces that can be used for gardening and landscaping.

Map Exercise: Making a Model Landfill

1. Locate the county where you live and place the number of facilities next to each term below. (Ask your parent or teacher for help if you are not sure where your county is).

____MSW Landfills
_____WTE Facilities
_____Incinerators

____MRF
_____C&D Landfills
_____Transfer Stations

_____Composting Facilities
____Wood Waste Facilities
_____Industrial Waste Facilities

2. Now record the number of facilities located in the county directly North of your county. If there is no county to the North, then use the county directly South.

____MSW Landfills
_____WTE Facilities
_____Incinerators

____MRF
_____C&D Landfills
_____Transfer Stations

_____Composting Facilities
____Wood Waste Facilities
_____Industrial Waste Facilities

3. How many Industrial Waste Facilities are there in the entire state? (Hint: use the Portland Metro Area Map Blow-up for better clarity). ____

4. How many composting facilities are located just in the Portland Metro area?________________

5. What year does this data represent?____

6. What is the difference between sending your garbage to a landfill or sending it to an incinerator?____

____

7. What are the two places represented on the map where garbage is only sorted or compacted but not actually disposed at that place?____

8. (Optional:) Using an accurate map of Oregon, compare the two maps and estimate the distance from your city to the nearest MSW landfills or incinerators in your county.

**Note that in some areas garbage must be transported long distances in order to get to the nearest MSW or incinerator which means that even more pollution is created just by transporting our garbage. So, remember to think before you waste and recycle everything that you can!*

Lesson: Classroom Trash Audit

Grade: 4-5
Subject: Math, Science
Objectives:

- define, give examples of, and sort waste
- identify the amounts of solid waste produced by individuals and groups

Teaching Time: 15 minutes introduction; return to lesson at the end of the day or the following day for about 35 minutes

Materials: 1 large garbage bag per student; large plastic or paper tarp; transparency, What's In Our Garbage?; worksheet, Garbage Audit and If Bagging Trash is Your Game; bathroom scale; gloves

(Optional:) A five gallon bucket to estimate the volume of materials sorted; video: *"Time's A Wasting: Garbage and Recycling in Oregon"* (see Resource section for availability)

REDUCE
REUSE
RECYCLE

Background

If students are going to help solve the garbage (waste) problem, they first need to understand the size of the problem. Throwing away a single gum wrapper or banana peel doesn't seem very important, until we see the cumulative impact of everyone's combined trash over a period of time. By performing a classroom or school wide waste audit, students will gain the necessary perspective to realize that everyone's individual waste contributes to solid waste management problems.

In this exercise, students will collect their own personal garbage for an entire day. Another option for this lesson is to assign your class as a team to collect representative samples from the school's waste bins. By performing a school waste audit, you can qualify to become an Oregon Green School. For details visit the Oregon Green School web site at www.oregongreenschools.org. Read about the Oregon Green Schools Association in the Teacher Resource section. You may also want to use Oregon Green Schools Tools as an additional resource for this lesson available at: www.deq.state.or.us/wmc/solwaste/edu.html.

Procedure:

INTRODUCTION

- **Who can tell me what garbage is? What is waste? Waste (garbage, trash) is material thrown away because it is worn out, used up, or no longer needed.**
- **Can anyone tell me some examples of waste.** Note: one person's garbage may be another person's treasure!
- **Let's see what kind of waste we make. Today you will be putting all of your garbage in your own personal trash bag. We will NOT be using the class garbage can (or recycling box). Remember, all of your waste goes in your bag.** Hand out a bag to each student. You may wish to cover the classroom garbage can and recycling box. Students should be told to take their trash bag to the cafeteria, too. You might tell students to collect DRY materials only, or use a separate plastic bag for food scraps, if desired. CAUTION: NO SHARP ITEMS OR BATHROOM WASTE.
- Ask the class to hypothesize which type of material will be present in the greatest amount at the end of the day.

END OF DAY

- **Let's look inside of our garbage bags and see what we have.** Get examples from students of what they have thrown away.
- Individually or as an entire class, sort and tally the number of pieces of garbage. Use Garbage Audit sheet for this activity.
- **What do you notice from doing the garbage audit?** Students should notice how much garbage is thrown away at school, and what types of things are thrown away.
- **How large will the pile be if we do this all week? All year?** (Get students thinking in terms of volume.)

- **How much do you think your trash weighs?** Weigh the individual bags or dump the trash on a tarp, pull it together and weigh it as one pile. **How much would a week's supply of garbage weigh? A year?** Do the calculations to find the answers!
- Show transparency, "What's in Our Garbage". **How does our garbage compare to what all of Oregon throws away?** You may fill in the data for Oregon on the picture of the garbage can.
- Have students identify the largest proportions of the trash—by weight and by volume—is there a difference?

Reflection/Response:

- Have students answer questions at the bottom of the Garbage Audit.
- **What would happened if there really was no place to throw our trash? What could you do to make less waste?**
- Have students write an imaginative essay about a make-believe town that no longer could collect its citizen's trash. Students should include what caused the problem and how the people tried to solve it.
- Assign the worksheet "If Bagging Trash is Your Game".

Extensions:

- Show video: "Time's A Wasting." Have students discuss what they saw in the video, especially the people making deliberate purchasing choices at the end of the video in order to create less garbage.
- Assign the Extension Lesson: "Take Home Trash Audit" or extend waste collection time and post results for a week or a month. Complete the weighing activity at the end of each day.
- Repeat this lesson after you complete several other lessons in this book. See if students are able to reduce the amount of waste generating by trying the suggestions they learn about reducing, reusing, and recycling.

Oregon Benchmark Standards:

Mathematics: Measurement; Statistics and Probability

- Read, construct, and interpret displays of data using appropriate techniques and technologies (e.g., charts, graphs, tables).
- Select the appropriate standard and nonstandard units and tools of measurement to measure to the degree of precision and accuracy desired in particular situations.
- Generate, compare, and analyze data to draw inferences and make predictions, using experimental and theoretical probability.

Science: Scientific Inquiry

- Formulate and express scientific questions and hypotheses to be investigated.

Grade 5 Benchmark:

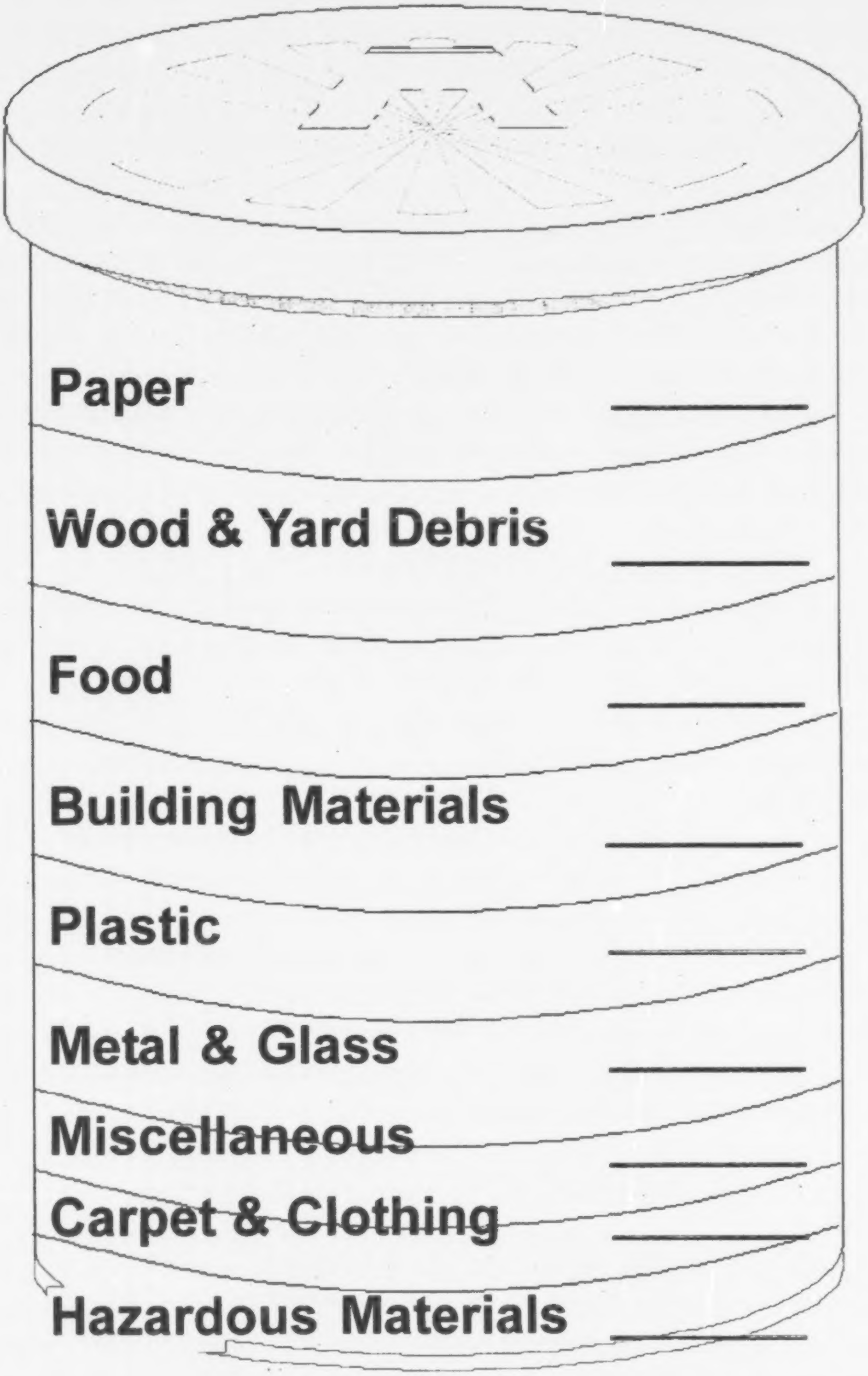
- Formulate and carry out simple experiments and simulations. Collect and analyze data using measures of central tendency.
- Select the appropriate units and tools to measure length, perimeter, weight, area, volume, time, temperature, money and angle.
- Collect, organize, display, and analyze data, using number lines, bar graphs, line graphs, line graphs, circle graphs, stem and leaf plots, and histograms.
- Ask questions and make predictions that are based on observations and can be explored through simple investigations.
- Analyze data to determine possible questions for further investigation.

1999 Data from the Oregon Department of Environmental Quality on Waste Composition:

Paper 24%
Wood and Yard Debris 16%
Food Waste 14%
Metal and Glass 10%
Plastics 10%
Building Materials 10%
Miscellaneous 9%
Carpet and Clothing 6%
Hazardous Waste 1%

To find updated statistics visit the Solid Waste website: http://www.deq.state.or.us/wmc/solwaste/rsw.htm or contact the Solid Waste Education staff at (503) 229-5913 or (800) 452-4011.

Overhead: What's In Our Garbage?



Paper ________

Wood & Yard Debris ________

Food ________

Building Materials ________

Plastic ________

Metal & Glass ________

Miscellaneous ________

Carpet & Clothing ________

Hazardous Materials ________

Worksheet: Garbage Audit

Name or Class or School____

Area of Audit (check one)

☐ Classroom ☐ Staff Room or Office ☐ Cafeteria ☐ Kitchen ☐ Other________

Instructions: Students should appreciate that individual garbage may be only a small amount. However, this garbage must be combined and total weights and volumes will be recorded so that you may calculate daily/weekly/monthly/yearly amounts for your class, your school or per person. Combine all individual bags into one large bag. If you are auditing a large area, weigh each container for the area.

Total weight of garbage including container or person's body weight __________**lb.**

Subtract the weight of the empty container or person's weight __________**lb.**

Total weight of garbage __________**lb.**

Total volume of the garbage __________**gal.**
(estimate based on the fullness of the bag or container)

Total weight of the garbage that is recyclable __________**lb.**

Waste Composition--What's in the Can?
(To do an in depth audit, you will need to classify materials into types under each category. For example, Paper: writing, brown bags, cardboard, etc.)

Material Type	Weight		Number of Items	Volume	
	Pounds	%Total		Gallons	%Total
Paper					
Plastic					
#1					
#2					
Other					
Metal					
Aluminum					
Other					
Glass					
Bottle Bill (deposit)					
Other					

Worksheet: If Bagging Trash Is Your Game

If Bagging Trash is Your Game, This Match is for You.
Match each word on the left with the phrase that best describes it.

Trash ____

Litter ____

Reuse ____

Natural Resources ____

Landfill ____

Recycling ____

Aluminum & Tin ____

Paper ____

Reduce ____

Compost ____

Pollution ____

A. To find a new use for something instead of throwing it away.

B. A recyclable material made from trees.

C. To buy less and to throw away less trash.

D. Leaves and grass clippings that are broken down by natural forces and can be used on gardens.

E. Our garbage, all the things we throw away.

F. Trash that is in the wrong place, such as on the ground or in the street.

G. Damage to the environment from chemicals or other human activities.

H. Metals that are made from minerals in the ground.

I. A special place in the ground where trash is buried.

J. Things that are found in nature such as air, water, trees, minerals that we use to make energy and to help us make other things.

K. A process that makes something new out of something old.

Extension: Take Home Trash Audit

Grade: 4-5
Subject: Math
Objectives:
Students will:

- estimate the amount of waste they personally create
- calculate the amount of waste they can save from landfills and incinerators if they recycle at different rates

Teaching Time: daily 10 minutes; wrap-up lesson 40 minutes at the end of the week

Materials: worksheet, How Much Waste Do I Create?

Background:

Before students can begin to understand the need for waste reduction and recycling, it is necessary first to understand the magnitude of the waste problem. The impact of a home waste audit is one of the most personal for students—it will allow students to calculate a per person average for garbage generation and recycling in their homes and is a very good math exercise.

Before completing the handout in this lesson, let students know that if their families do not recycle to enter zero in the spaces provided. Explain that not everyone in the same community has the same access to recycling in some parts of Oregon and that other families may chose not to participate for one reason or another. (For example, in some areas, people may only have recycling at curbside if they own a home, but not if they live in apartments, or in other areas people may have to drive their recycling to a facility in order to recycle).

Procedures:

- **How much trash do you through away each day? Each person in the United States makes about four pounds of waste each day. This amounts to 3/4 of a ton per year. Do you think this is true for you?**
- Tell students they will weigh waste at home for one week and complete the worksheet, "How Much Waste Do I Create?" and by the end, they will be able to estimate how much waste they create every day.

Reflection/Response:

- When students are finished with their worksheets, have them bring them to class and compare the amount of waste created in different households. Note that you are creating a "data set". All the numbers vary from family to family depending on what they were doing that particular day.
- Calculate (or ask students to calculate) the average amount of waste generated in one year for the entire class. Now calculate the amount created per person/day. **Is this number the same or different from your individual calculation? What happens when we take a large data set and average the numbers together?**
- Now create a data set for the class on the percentage of waste that they recycle (from question 10). Envision different scenarios and do the calculations for the students, e.g., if a person is recycling 10%, how many more materials would they conserve if they recycled 20% or 35% or 50%. Use the class average for percentage recycled to create hypothetical improvements.

Oregon Benchmark Standards:

Common Curriculum Goal:

Mathematics: Measurement

- Describe, estimate, and use measures of length, perimeter, weight, time, temperature, money, and capacity.

Mathematics: Calculations and Estimations

- Demonstrate conceptual meanings for addition, subtraction, multiplication, and division.

Grade 5 Benchmark:

- Measure length, perimeter, weight, area, volume, time, temperature, and angle using standard and nonstandard units of measurement.
- Perform calculations on whole numbers, fractions, and decimals using paper and pencil and calculators.

Worksheet: How Much Waste Do I Create?

Dear Parent(s): Your child is currently learning about natural resources, solid waste issues and the environment. Part of the lesson includes helping the student understand their household's and their individual contribution to generating waste. Most of the calculations required on this worksheet are simple subtraction, addition, multiplication and division problems. However, the numbers may be larger than your child is used to working with, so guiding your child through these calculations may be necessary. Also, your help setting up the exercise is appreciated (see question #1). If you do not have a weight scale in your house, please estimate the weight of your trash and recycling for your child.

1. Weigh every bag of household trash that was generated over a one week period of time. (If possible, empty all the bags out and start from zero, then weigh the total household trash at the end of seven days).
   Hint: You can weigh the trash by weighing yourself on a bathroom scale first, then weigh yourself while holding all the trash in one bag. If your family has more than one bag, do this for each bag. Now, subtract your weight from the weight of you and the trash bag. This is the weight of the trash only. Do this for each bag, if you had more than one, now add all the weights of the trash bags together to get the total.

   Enter your household trash weight here:______________________________

2. Multiply the total for one week by 52 weeks in one year to find the amount of trash your family generates in one year:______________________________

3. Part 1. If you bag your leaves or grass, multiply the weight of one bag (about 40 pounds) times the number of bags you throw out in l year. (Use a rough estimate if you cannot remember).

   ____

   Part 2. Do your leaves and grass get collected separately from the trash by your garbage company or collected separately at the drop off station or dump?* (YES or NO)
   ***Note: if you live in apartments, condos, or other residence where your green waste is taken care of by a business gardening service, you will not count green waste as part of your recycling or garbage.*

4. Weigh one week of recyclables. (Aluminum, steel, newspaper, plastic, glass, cardboard--whatever you recycle--using the same method as in step number one).

   The weight of our household's recycling for one week is:____________________

5. Multiply the answer in #4 times 52 weeks in one year to find how much your household recycles in one year:______________________________

6. Add the answers for 2 + 3 + 5 to find out how much TOTAL waste (including recycling) your household generated for one year.______________________________

**If you answer yes, this number gets counted as part of your household recycling rate because your yard waste is being collected for composting. If you answer no, this number gets counted as part of your landfilling or incineration rate.*

7. Divide #6 by the number of people in your household. This is the average waste you created or GENERATED in l year per person.__________

8. If you answered "no" to the second part of #3, then add the answers for #2 and #3 together.

____

Now divide the number above by the number of people in your household. This is the average waste you create per person which goes to the landfill or incinerator in 1 year.

____

If you answered "yes" to the second part of #3, then divide the answer from #2 by the number of people in your household. This is the average waste you create per person that goes to the landfill or incinerator in one year.

____

9. If you answered "yes" to the second part of #3, then add the answers for #3 and #5 together.

____

Now divide the number above by the number of people in your household. This is the average waste you create per person which is being recycled in one year.

____

If you answered "no" to the second part of #3, then divide the answer from #5 by the number of people in your household. This is the average waste you create per person which is being recycled in one year.______________________________

*THESE ARE NATURAL RESOURCES THAT YOU HAVE CONSERVED!

10. What percentage of the waste you create in one year do you recycle?

(Divide the answer of #9 by the answer in #7)______________________________

11. Bonus: Can you calculate how much trash you generate every day?

(Hint: Use the answer in #8 and divide by the number of days in one year.)

____

Source: Minnesota Office of Environmental Assistance: *Whata Waste K-6 Waste Management Education Curriculum. Edited by Oregon Department of Environmental Quality.*

Lesson: Spanish Lessons on Waste

Grade: 4-5

Subject: Second Language Writing & Vocabulary

Objectives:

- to broaden and strengthen second language skills
- learn vocabulary and issues surrounding solid waste in Oregon in English and Spanish

Teaching Time: Introduction, 30 minutes to discuss the new vocabulary words and hand out the worksheet.

30 minutes to complete the worksheet and additional time to complete the crossword, if desired.

Materials: Transparencies, Simple Diagram of a Landfill and Oregon Waste Hierarchy; Readings and Worksheet, Maria Learns About Waste in English and Spanish and Vocabulary page; handout, Crucigrama

REDUCE
REUSE
RECYCLE

Background

This lesson, which may be used as an exercise in English-to-Spanish translation (or vice versa for English as a second language students), presents the fundamental issues associated with our garbage and some simple actions that a person can do to help manage the garbage problem. The students will learn new Spanish vocabulary words that describe waste, it's disposal, and managing waste by reducing, reusing and recycling (also called the Oregon Waste Hierarchy).

Procedure:

INTRODUCTION

Today we are going to do a worksheet called "Maria Learns About Waste".

- Instruct the students on whether they will be expected to read the Spanish or the English version of the dialogue first and if they should answer the questions in Spanish or English.
- Go over the vocabulary words on the worksheet and any other new words that might be introduced by this lesson and practice the pronunciation with the class.
- Take turns reading the Spanish aloud among the students. (You may want the students to read the English version first so that they have a better understanding of the content when they read the story in Spanish).
- Show the transparencies "Simple Diagram of a Landfill" and "Oregon Waste Hierarchy" to enhance the concepts of this lesson.
- Ask students to volunteer some simple sentences out loud using these vocabulary words and other words they know. For example, "I recycle!", "My family recycles", etc.

Reflection/Response:

- After completing the worksheet, have the class discuss the things they learned about dealing with garbage in Oregon.

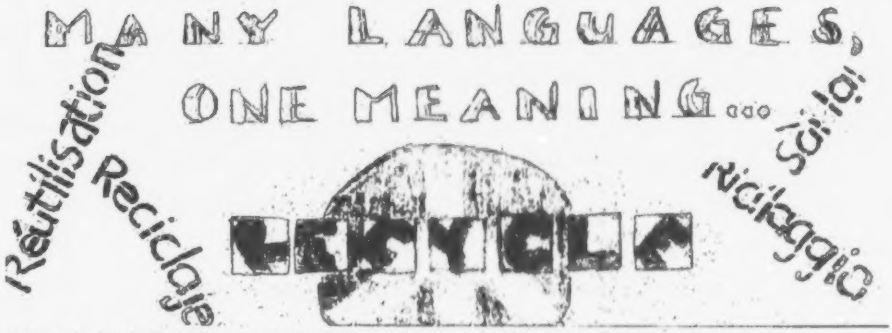
Oregon Common Curriculum Goals:

Second Languages: Communication;

- Connection to Other Disciplines
- Content standards: Listening: Listen to/receive messages for a variety of purposes; Speaking: Speak/sign for a variety of audiences and purposes; Reading: Read to comprehend a variety of printed materials; Writing: Write/compose effectively for a variety of audiences and purposes; Reinforce and increase knowledge of other subjects through the second language.

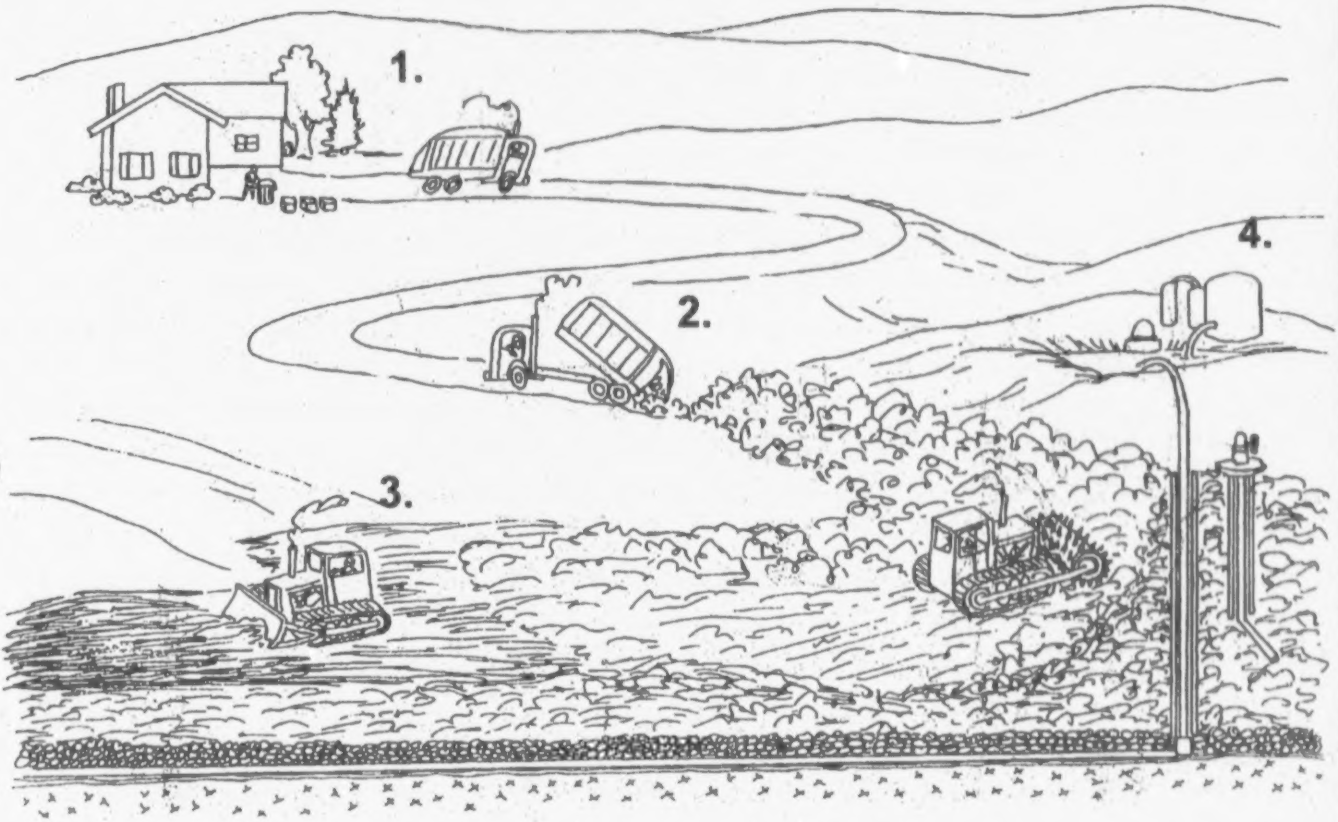
Grade 5 Benchmarks:

- Comprehend familiar ideas and details in short sentences and simple questions on a limited range of topics; Use simple memorized phrases, sentences and questions on a limited range of topics; Write/compose short phrases, lists and simple sentences.


MANY LANGUAGES,
ONE MEANING...
Réutilisation
Reciclaje
RECYCLE
Sài lại
Riciclaggio

Artwork: Linh Bui, Grade 8, Archbishop Howard Catholic School. Submitted for the Metro Regional Services Earth Day Bill Board Contest, 2001.

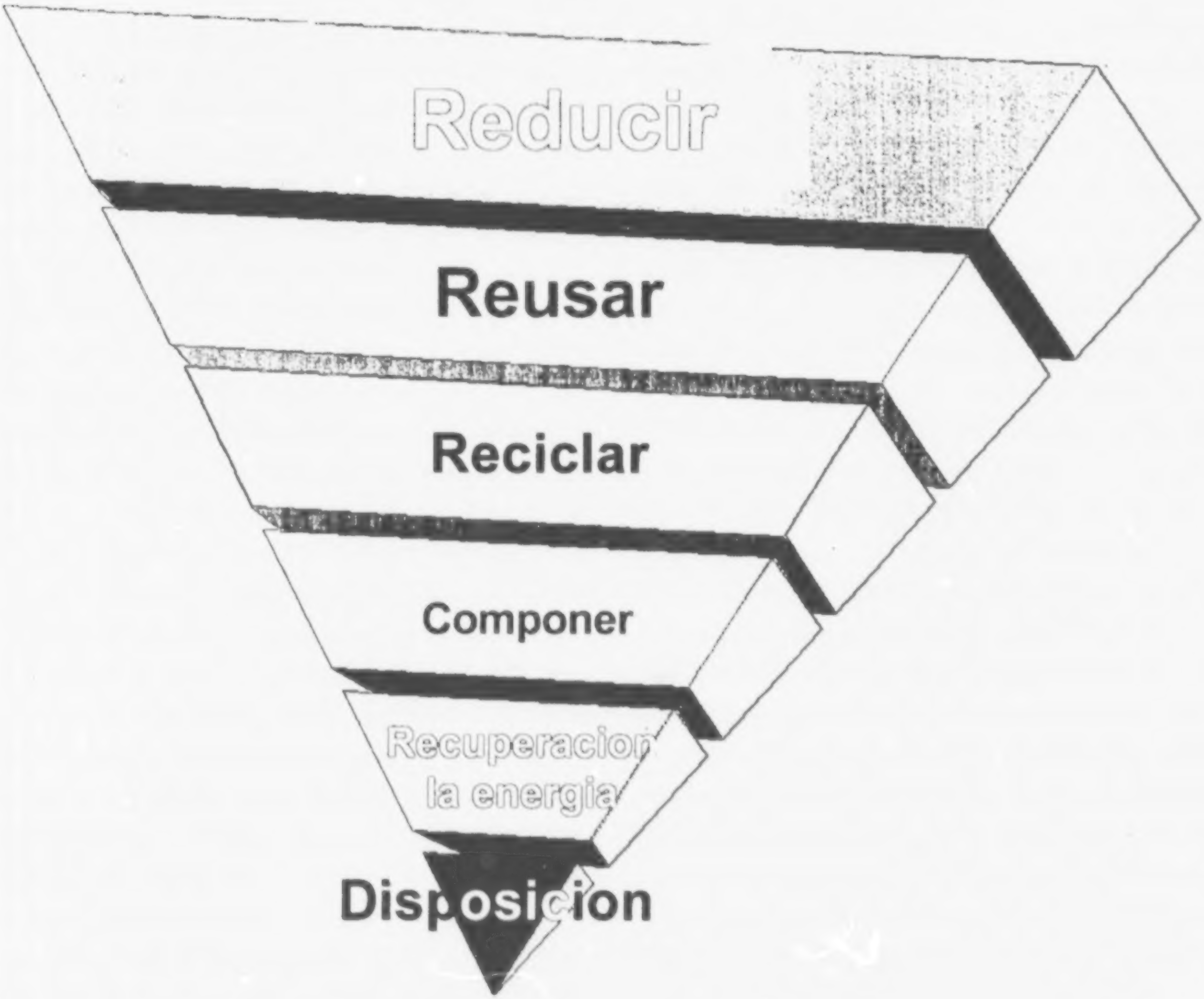
Overhead: A Simple Diagram of a Landfill



1. La basura se remueve de su casa
2. La basura se lleva al basurero
3. La basura es comprimida y enterrada en el basurero
4. Equipo que chequea el agua subterránea para cerciorarse de que esté libre de contaminantes

Source: California Integrated Waste Management Board: *Closing the Loop: Exploring Integrated Waste Management and Resource Conservation K-6* (2000)

Overhead: The Oregon Waste Hierarchy



Reducir

Reusar

Reciclar

Componer

Recuperacion
la energia

Disposicion

Worksheet: "Maria Learns About Waste"

Maria: Hey, Carlos! Have you ever thought about what happens to garbage when you throw it away?

Carlos: Why would I waste my time thinking about that?

Maria: Well, because there are so many people in the world, what if we run out of places to put our garbage?

Carlos: I guess you have a point. Let's call the city and county people who manage our garbage to find out more. Let's talk again tomorrow.

(NEXT DAY)
Maria: Hey Carlos, I found out a lot of great information! For example, most of our waste in Oregon goes to landfills where it is buried deep in the ground. A small amount also gets burned in special places called incinerators. Both landfills and incinerators can cause pollution that is dangerous for people and animals, so we have to find a better way to deal with our garbage!

Carlos: Well, I searched the internet and found garbage statistics on the Oregon Department of Environmental Quality's web site! Did you know that most of the waste in Oregon comes from all kinds of paper and paper packaging like boxes? Also, a lot of our waste is from food and green stuff in our yards like grass and leaves.

Maria: That's interesting. I've got some great tips on how to keep waste from piling up so that we don't have to worry about where to put it.

1) Reuse things as many times as you can before throwing it away. Examples: try fixing things instead of buying a new one; give unwanted clothes and toys to someone else who will enjoy them
2) Recycle all the things that you can.
3) Compost the plant waste in your yard instead of burying or burning it.
4) Do things to reduce how much waste you create such as: avoid buying things with lots of packaging, especially packaging that can't be recycled!

Carlos: Cool! Maybe our teacher will give us extra credit if we do a presentation to the class on creating less garbage!

Questions

(Answer the questions in Spanish using the vocabulary words).

1. Where does most garbage in Oregon go?

2. What material(s) makes up most of Oregon's garbage?

3. What are the four ways that we can avoid throwing things away?

Vocabulary Words

Substantivos (nouns)

garbage	basura
people	gente
world	mundo
places	lugares
point	punto
city	ciudad
county	condado
tomorrow	mañana
time	tiempo
information	información
example	ejemplo
waste	desperdicio
landfills	basurero
ground	suelo
amount	cantidad
pollution	contaminación
incinerators	incinerador
internet	internet
web site	la página Web
statistics	estadística
paper	papel
packaging	empaque
boxes	cajas
food	comida
stuff	cosas
yards	jardín
grass	pasto
leaves	hojas
tips	ideas
things	cosas
plant	planta
clothes	ropas
toys	juquetes
teacher	maestro
credit	crédito
presentation	presentación
class	clase

Adjetivos (adjectives)

great	grán
most	mayoría
deep	profundo
small	peqeño
special	especial
green	verde/inmaduro
interesting	interesante
new	nuevo
unwanted	no deseado
extra	adicional
less	menos
dangerous	peligroso
better	mejor
all	todas

Verbos (verbs)

to throw	tirar
to think	pensar
to waste	desperdiciar
to manage	manejar
to find	encontrar
to bury	enterrar
to burn	quemar
to cause	causar
to search	buscar
to know	saber
to keep (from)	evitar
to pile	acumular
to worry	preocupar
to reuse	reusar
to compost	componer
to create	crear
to avoid	evitar
to reduce	reducir
to buy	comprar
to recycle	reciclar
to make	hacer

Otras Palabras (other words)

ever	porsiempre
about	acerca
away	lejos
again	de nuevo
also	tambien
both	juntos
like	como
a lot	bastante
from	de
some	algunos
up	arriba
before	antes
instead	enves de
both	juntos

María Aprende Acerca de Deshechos

María: ¡Hey, Carlos! ¿Has pensado lo que pasa con la basura después que la tiramos?

Carlos: ¿Porqué desperdiciar mi tiempo en pensar acerca de la basura?

María: Bueno, porque hay mucha gente en el mundo, y ¿que pasaría si no hay más lugares para poner la basura?

Carlos: Me parece que si tienes razón. Llamemos a la oficina de la ciudad o del condado quienes manejan se encargan del manejo de nuestra basura para averiguar más. Hablemoles mañana.

(El siguiente día)
María: Hey Carlos, ¡Averigüé muchas cosas! Por ejemplo, la mayor parte de nuestros deshechos en Oregon son enterrado bajo tierra. Una porción de estos deshechos son quemados en lugares llamados incineradores. Los dos, los basureros e incineradores pueden causar contaminación que puede ser dañina para la gente y animales, por lo qué ¡Tenemos que encontrar una mejor manera de tratar nuestra basura!

Carlos: ¡Busqué en el internet y encontré información acerca de la basura, en la página WEB del Departamento del Medio Ambiente! ¿Sabías tú que la mayoría de los deshechos en Oregon son material usados para empacar, y material de cajas de cartón?

María: Muy interesante. Tengo unas ideas de como podemos evitar que la basura se acumule tanto que no tengamos lugar para ponerla. ¿Que te parece?:

1) Reusar nuestras pertenencias tanto como podamos antes de tirarlas. Por ejemplo, reparar ó componer radios, lámparas u otros objetos; Regalar ropa/juguetes usados
2) Reciclemos todas las cosas que podamos.
3) Hagamos un compuesto con el material de deshecho vegetal de nuestros jardines, en lugar de tirarlo a la basura.
4) Evitemos comprar cosas con mucho empaquetado que no se pueda reciclar.

Carlos: ¡Bueno! ¡A la mejor nuestro maestro nos permite obtener extra-crédito si platicamos en clase de como reducir basura!

Ejercicios

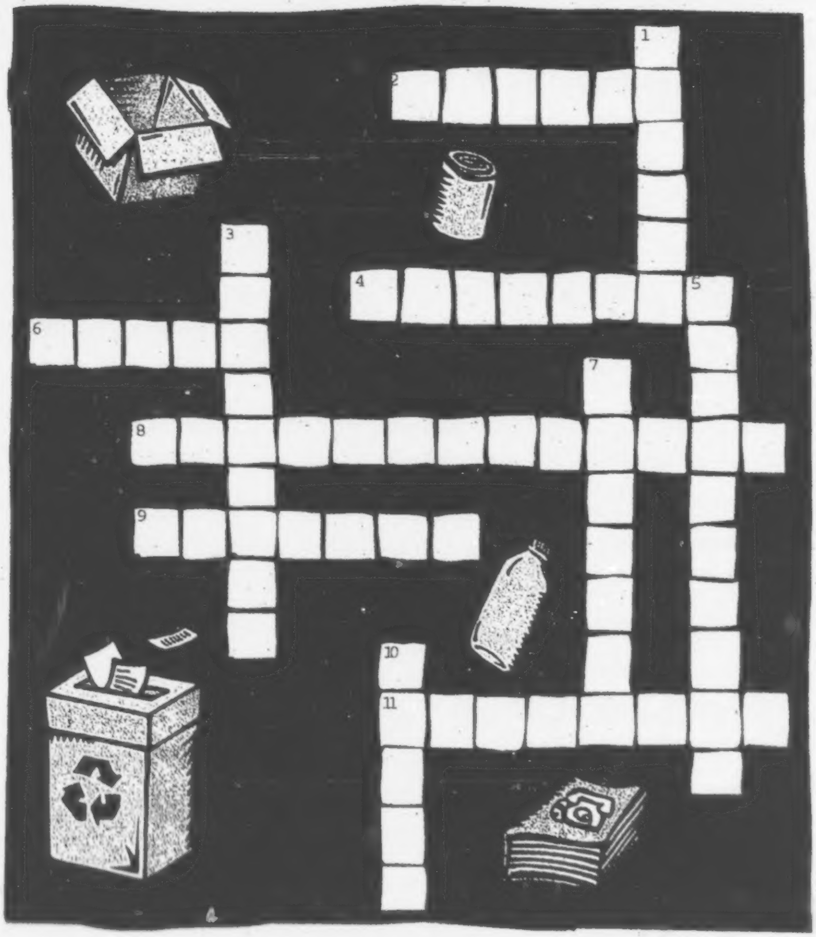
(Answer the questions in Spanish using the vocabulary words).

1. ¿ A donde va la mayor parte de la basura en Oregon? *(Where does most garbage in Oregon go?)*

2. ¿Que materiales componen la mayor parte de la basura en Oregon? *(What material makes up most of Oregon's garbage?)*

3. ¿Cuales son las cuatro maneras con las que podemos evitar tener que tirar/deshechar objetos? *(What are the four ways that we can avoid throwing things away?)*

Crucigrama



Horizontales

2. Los combustibles fósiles como el carbón, el petróleo, y el gas natural, que se usan para fabricar productos y para calentar nuestras casas, provienen de la __________. El aluminio, el mineral de hierro, y otros minerales utilizados para hacer productos nuevos provienen del mismo lugar.

4. Lo que más de 3,000 comunidades hacen con sus periódicos, botellas, latas, y otros objectos.

6. En lugar de desecharlos, puedes _________ viejos juguetes, viejos muelbles, articulos de dibujo y pintura, y libros a las esculeas, centros comunitarios, bibliotecas, o amigos.

8. Su mundo, lo que te rodea, y la fuente de la vida y la salud. Hecha de aire, agua, tierra, plantas, animales, y gente.

9. Si tú compras una bolsa grande de papas fritas en lugar de cinco bolsas pequeñas, estás comprando __________. Muchos supermercados tienen secciones de comida donde puended tomar la cantidad que deseas y por tanto reducir el desperdicio y los envases.

11. Hay desechables y recargales. Se usan en los teléfonos portátiles, radios portátiles, cámaras, y linternas.

Verticales

1. Muchos elementos de la ____________ pueden reciclarse para hacer nuevos productos valiosos.

3. Los refrigeradores, televisiones, secadores de pelo, alfombras, y llantas son ejemplos de productos ___________. Pueden durar mucho tiempo antes de desencharse.

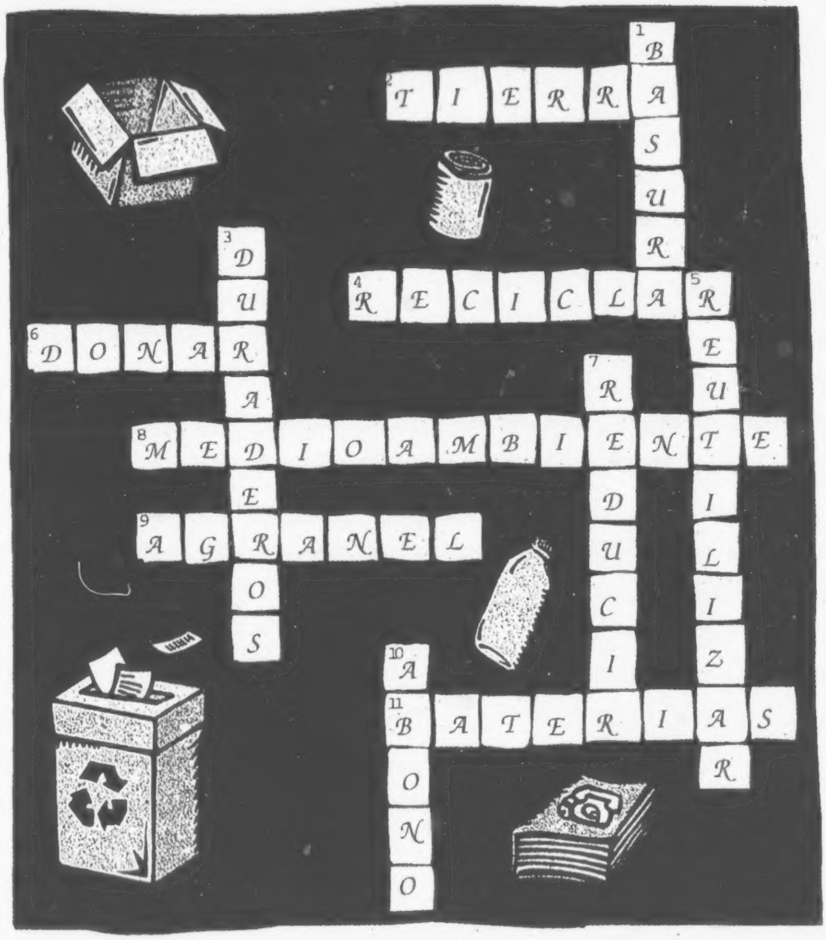
5. Usar algo otra vez con el mismo fin o con un nuevo fin.

7. Para disminuir la cantidad de basura que tú desechas.

10. Una mezcla descompuesta de restos de comida, hojas, y hierba. Pueda usarse en jardín como fertilizante.

Respuestas

Horizontales



2. Los combustibles fósiles como el carbón, el petróleo, y el gas natural, que se usan para fabricar productos y para calentar nuestras casas, provienen de la __________. El aluminio, el mineral de hierro, y otros minerales utilizados para hacer productos nuevos provienen del mismo lugar.

4. Lo que más de 3,000 comunidades hacen con sus periódicos, botellas, latas, y otros objectos.

6. En lugar de desecharlos, puedes __________ viejos juguetes, viejos muelbles, articulos de dibujo y pintura, y libros a las esculeas, centros comunitarios, bibliotecas, o amigos.

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Source: U.S. Environmental Protection Agency, http://www.epa.gov/epaoswer/general/espanol/4-6span.pdf

Lesson: Needs and Wants

Grade: 4-5
Subject: Social Science, English
Objectives:
Students will:

- recognize the impact of humans on natural systems
- make predictions about the impact of certain behaviors and how personal or cultural perspectives affect these behaviors
- assess factors that affect consumer purchases
- recognize that responsible consumer choices can result in reduced waste and environmental impact

Teaching Time: 45 to 55 minutes

Materials: *The Lorax* by Dr. Seuss (book or video); Instructions, Needs and Wants Game; Needs and Wants activity cards--photocopy to make one set per pair of students; one envelope to hold each set of activity cards; scissors

(Continued...)

Concept adapted from the Association of Vermont Recyclers: *AVR Teacher's Resource Guide For Solid Waste and Recycling Education (reprinted 1999)*

REDUCE
REUSE
RECYCLE

Background:

The amount of municipal solid waste disposed in Oregon in 1999 was 2.8 million tons or 1,690 pounds per person per year (about 3/4 of a ton). This translates to 4.5 pounds of municipal solid waste disposed per person per day. Solid waste disposal depletes Oregon of valuable lands, habitats, and natural resources, as well as, potentially causing pollution that future generations will have to clean up. We all contribute to the solid waste problem through our daily habits of purchasing and using resources. We all, therefore, are responsible for helping to solve it.

Every individual has a different idea about what defines a "need" and a "want," depending on his or her culture, background, values, and situation. Although every person has different ideas about what is necessary to him or her, there are certain basic needs that all humans share, including biological needs (food, water, air, shelter); social needs (clothing, feelings of belonging and protection); and spiritual needs (faith, love, hope). Students can examine their own feelings about needs and wants in order to learn to make responsible consumer choices that reduce waste and save natural resources.

Procedures:

Part I: Introductory Discussion

- **What are some of the consequences of producing lots of trash?** Students should recall that it smells, and because everything we throw away was originally made from a natural resource, it breaks the earth's natural cycle because these things are buried and lost forever.
- It also costs us money to get someone to come to our house and take our trash away. Generally, the more trash we generate the more we pay to dispose of it.

Part II:

- Read or watch *The Lorax* by Dr. Seuss.
- Discuss the following questions in the reflection section and include the Game Wants and Needs into the discussion. Have the students complete the worksheet.

Reflection/Response:

- **How did each step of the Once-ler's developing business destroy a piece of the ecosystem until the entire system ceased to function?**
- **Why was the Super Axe Hacker invented?**
- **Why did the Once-ler ignore the Lorax's warnings?**
- **What happened to the Lorax?**
- **What did the Lorax's message "UNLESS" mean?**
- **What are some of the environmental consequences of living in a culture with a lot of wants?** You might use the Lesson on Native American Culture to help students understand that not all cultures have as many wants as people in the U.S. Also, suggest that some

people consider environmental consequences when considering purchases and other choices about their lifestyle such as how big of a car to drive (smaller cars create less air pollution) or to walk or bike instead of driving whenever possible.

- (Optional) Play the Wants and Needs Game--see instructions in this lesson.

(Optional:) Play, Throwaway Three

Extensions:

- Read and discuss the play the Throwaway Three. **Do different people have different ideas about what they need? Is there something that you consider a need that someone 100 years ago or in a third world country today might consider a want?**
- The Lorax spoke for trees "for trees have no tongues." Ask students to plan a three minute talk on something which cannot speak for itself.
- Have students create an illustrated book of needs and wants using photos from magazines or their own drawings.
- Have students reflect on their own needs and wants by writing a cinquain poem:

Cinquain Rules:
1st line: 1 word (noun) giving title or topic
2nd line: 2 words (adj./adv.) describing the title or topic
3rd line: 3 words (verbs) expressing an action
4th line: 4 words expressing a feeling about the topic
5th line: 1 synonym for the title, or repeat the title

Samples:

WATER
Wonderfully wet
Trickling, roaring, moving
It feels so cool
Wetness

TELEVISION
Loud, constant
Blaring the news
It makes me crazy
TV

WIND
Waving, blowing
Moving rain clouds
Nice on my face
Breath

Oregon Common Curriculum Goal:

English: Writing, Reading

- Use a variety of written forms (e.g., journals, essays, short stories, poems, research papers, business and technical writing) to express ideas appropriate to audience and purpose
- Demonstrate literal comprehension of a variety of printed materials.

Social Science: Analysis

- Explain various perspectives on an event or issue and the reasoning behind them
- Identify, analyze, and select a course of action to resolve an issue.

Grade 5 Benchmark:

- Write in a variety of modes (e.g., narrative, imaginative, expository, persuasive) and forms (e.g., essays, stories, reports) appropriate to audience and purpose.
- Identify sequence of events, main ideas, facts, supporting details, and opinions in literary, informative, and practical selections.
- Identify and study two or more points of view on an event, issue, or problem.
- Explain characteristics of an event, issue, or problem, suggesting possible causes and results.

Worksheet: Needs and Wants

Student Name:______________________________

1. Why did the Once-ler cut down the Truffula trees?____________________

2. Why do the Brown Bar-ba-loots have to leave?____________________

3. What kinds of problems does the thneed factory cause for the environment? Name at least three.

4. What happens to the Once-ler when there are no more Truffula, trees?____________________

5. What happens to the Lorax?____________________

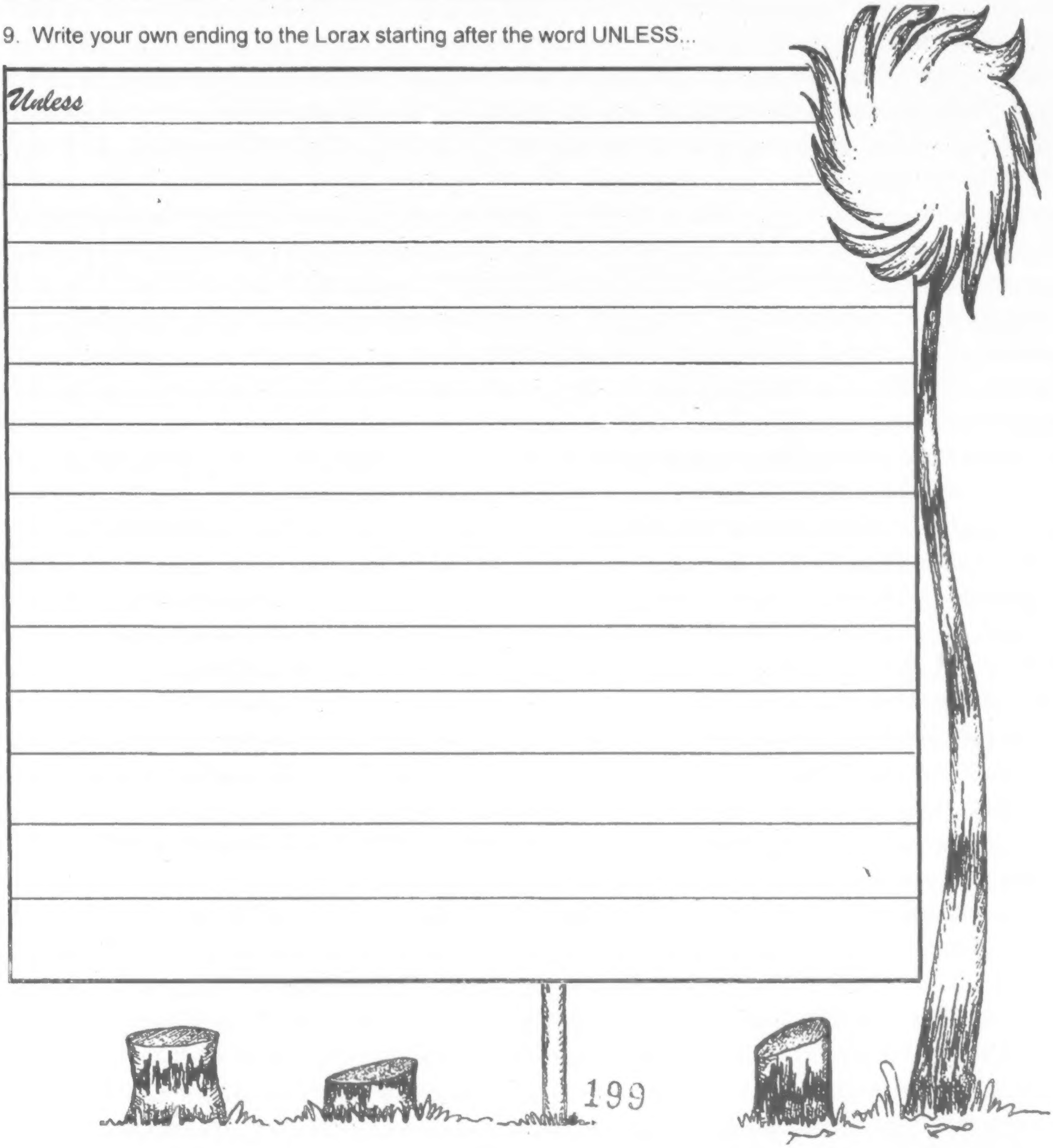
6. Is bigger always better? Give an example to back up your opinion.____________________

7. A "Thneed" is defined as a fine thing that everyone thinks they need. What are some examples of thneeds - things that we think we need?____________________

Source: Association of Vermont Recyclers: *Teacher's Resource Guide for Solid Waste and Recycling Education* (1999)

8. If you were the Once-ler, what would you have done differently to protect the environment?

9. Write your own ending to the Lorax starting after the word UNLESS...



Unless

Needs and Wants Game Instructions

Directions:

1. Copy the Needs and Wants Worksheets so that each pair of students will have a set (be sure to make single-sided copies, as the backs of the cards must be blank). Cut the cards along the dotted lines and place each set of cards into an envelope. Students can help, and they can mount the cards with glue onto a thicker paper (used file folders, paper board, etc.), to make them more sturdy.

2. Divide the students into pairs. Pass out one envelope of cards to each pair. Direct them to sort their cards into piles that are alike in some way. Ask the students to explain which "rule" they used for sorting the cards. (List the rules the students used on the board). Encourage them to look for new ways to sort the objects if they can think of more.

3. Have students put the cards back into the envelopes, then discuss what is the difference between a NEED and a WANT.

   Can you live without the things you need? What about the things you want?
   Now tell them to resort their cards using this criteria.
   Ask students to define the criteria they used to decide if something is a need or a want. Students might offer answers such as cost, parent/legal permission, personal safety, peers, etc.

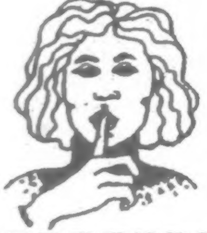
4. Lead a class discussion on basic needs for life and how that might differ from culture to culture. Teach students how affluent societies tend to have more "NEEDS" (really WANTS) because of their lifestyle, but that many of these things are not really necessary.

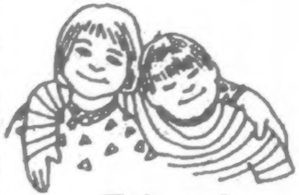
5. Have students make a list of things that they have recently purchased or been given. Write an N or a W next to each item. Have students reflect on the things that they personally own such as toys, electronics, clothes, recreational gear. Ask them to write down examples of things they have multiple copies of such as shoes, jackets, games, stuffed animals. Underline the items that you could do without if you had to and circle the items that you would always want to have. Discuss how students can assess whether or not they have "enough" and how they might find other ways to be happy without accumulating new things all the time and without creating more garbage. Also, you might help students think about the money they and their families can save by foregoing unnecessary purchases. By only buying what we need, we are freeing up our own monetary resources for a better use like a savings account, or the purchase of a more expensive item that will last a long time. Examples of alternatives to our "wants" are: building or creating art or toys for yourself; exchanging one toy for another with a friend or group of friends; go to the library and check out books on new subjects to learn new interests and skills, etc.

Needs and Wants Game Pieces

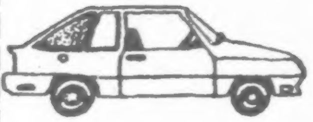
Source: California Department of Health Services Toxic Substances Control Program
The No Waste Anthology (1991)

Quiet

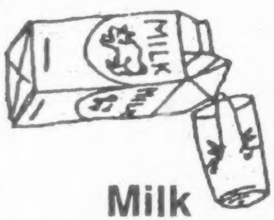




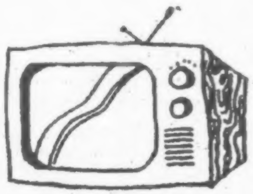
Friends



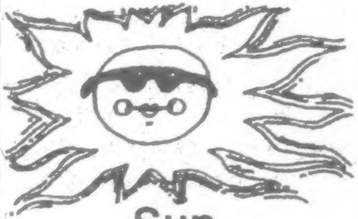
Car



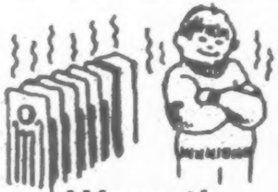
Milk



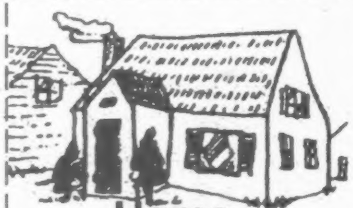
Television



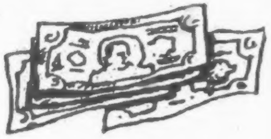
Sun



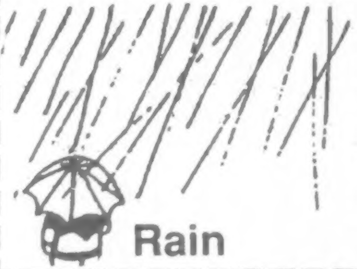
Warmth



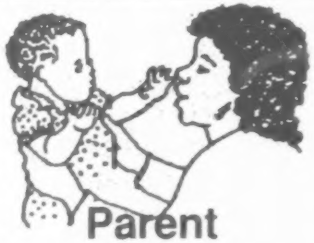
Home



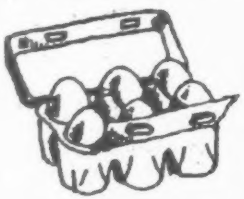
Dollars



Rain



Parent

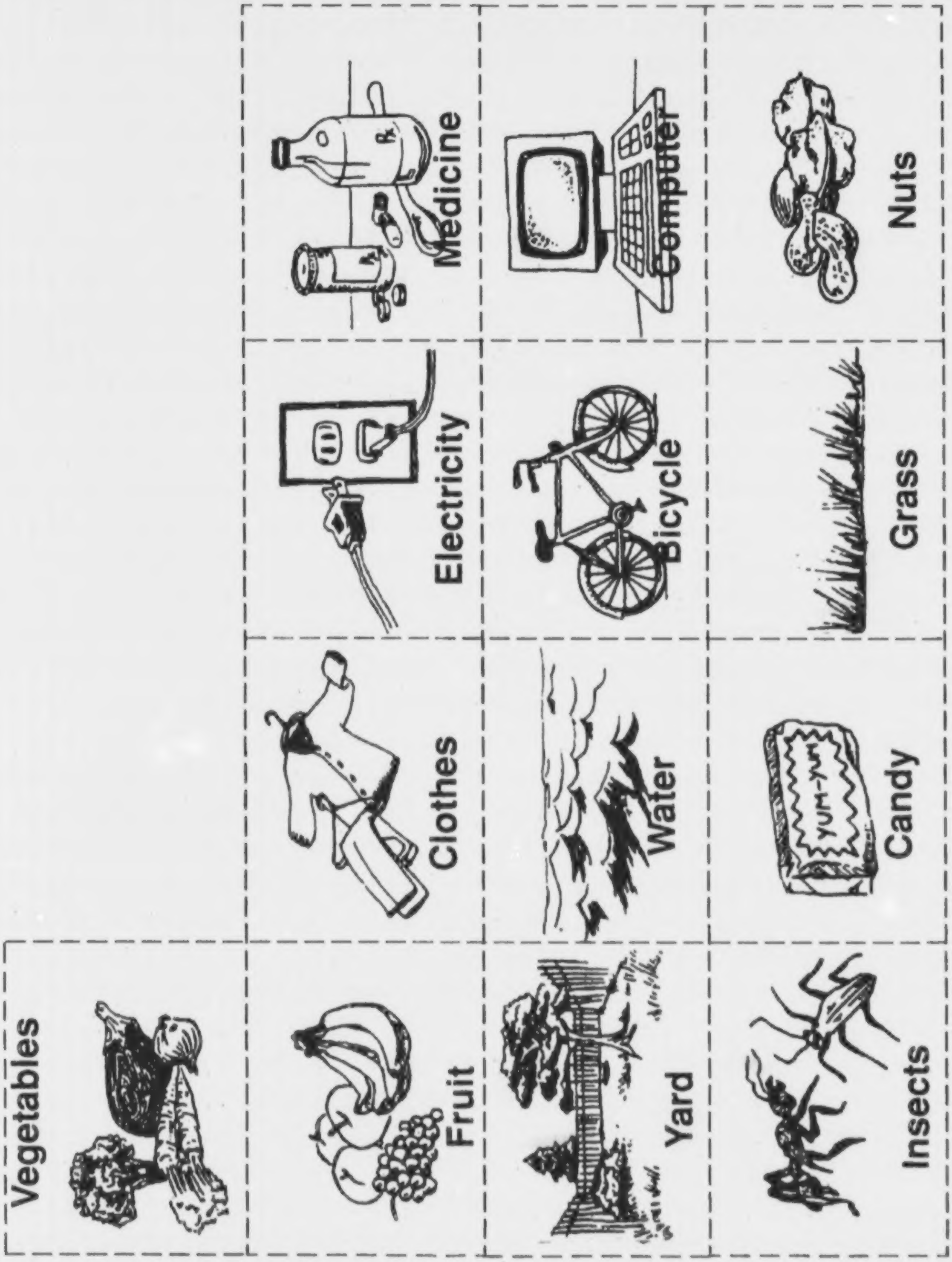


Eggs

Air

Needs and Wants Game Pieces

Source: California Department of Health Services Toxic Substances Control Program
The No Waste Anthology (1991)


Vegetables
Fruit
Yard
Insects
Clothes
Water
Candy
YUM-YUM
Electricity
Bicycle
Grass
Medicine
Computer
Nuts

Lesson: Buyer's Choice

Grade: 4-5
Subject: Social Science, Math
Objectives:
Students will:

- assess the factors that affect purchases
- recognize that a number of economic factors affect consumer choices and that some factors are environmental in nature.

Teaching Time: 45 minutes

Materials: worksheet, Buyer's Choice; Buyer's Choice Postcards; heavier stock paper (to make the postcards); glue; scissors

(Optional:) magazines; large construction paper; copy advertisements targeting children on video and discuss with the class (see Ads Add Up K-3)

REDUCE
REUSE
RECYCLE

Background:

By making very simple changes in our purchases, we can prevent waste by not generating it in the first place. Such changes include making purchases of high quality, durable products, reusing what we can, and recycling as much as possible. Being a "cautious consumer" can help the environment more than most people ever realize. The majority of waste is generated during the manufacturing, processing, and distribution of a product. Moreover, air and water pollution also occurs during manufacturing and distribution of a product as well. Thus, by picking products that are durable, reusable, recyclable and not overpackaged and by buying locally made products whenever possible, we can make a direct impact towards protecting the environment. This helps reduce the amount of waste generated, reduces stress on the roads during transportation to markets and helps reduce the amount of air and water pollution released. (See lessons on recycling materials (All About Aluminum, etc.) for specific statistics on the benefits of recycling).

Procedures:

- **Today we are going to learn about products (the things that we buy) and consumer choices.** Define consumer for the class.
- **What are the most common reasons for buying a product?** List them on the board. Responses should include convenience, price, quality, advertising persuasion, etc. Students will probably not think of the environmental reasons that might influence their choices. Let them know that people commonly overlook other aspects of buying a product, such as: Is the product itself recyclable or reusable? Is the packaging? Does the product come in a lot of unnecessary or excessive packaging that will only have to be thrown away? How far did the product have to travel to get to the store? (Shipping and transportation also contribute to environmental pollution). **People may not always see the connection between what they are buying and the amount of waste they are generating.**
- **What is the definition of 'disposable'? It usually means a one-time use item (i.e., paper napkin), or an item that can be used many times for a short period before throwing it away (i.e., toothbrush).**
- **Who can tell me what durable means?** Name some of the things that your family owns that are durable. Generally, the more we pay for an item, the more likely it is to be a durable. For example, toothbrushes are very inexpensive and are not made to last over time, but metal razors are more expensive and we only replace the blades instead of the entire product. **Note: comparing cost to durability usually makes the durable item cost effective in the long run.*
- Have class brainstorm a list of disposable and durable items. Example:

disposable diapers v. cloth	paper cups v. glass
disposable razor v. durable	paper plates v. ceramic

- **Do you think people can help the environment by asking themselves some simple questions about what they are buying? Yes!**

- **How will the environment be helped?** (List the reasons on the board). Students should come up with answers like: Fewer natural resources will be used up, Less pollution will be generated and less waste will be created, etc.

Reflection/Response:

- Ask students to develop a list of questions that informed consumers can ask themselves when making a decision about what to buy. (i.e., Will it last a long time?, Can I fix it if it breaks?, Do I really need this at all?, Is there a more environmentally friendly option?).
- Discuss the role of advertising in purchasing. (Note: ads give you information--sometimes correct, sometimes not, and they "appeal" to your emotions so that you will identify a certain feeling with that item--like drinking a soda=happiness, wearing brand name clothing=social acceptability, etc.).
- Have students complete the first part of "Buyer's Choice Worksheet" and then handout or have students create the "Buyer's Choice Postcards." Tell students to complete the At Home Investigation for homework and choose one product that they found to be less environmentally friendly that they will use the Buyer's Choice Postcard (or write a business letter) to communicate their opinion to the manufacturer.

Extensions:

- Discuss the ways in which advertising influence consumer decisions. Cut out some magazine ads or video tape ads targeting children and analyze the messages and their impacts.
- Have students gather and compare costs and the life span of comparable disposable and nondisposable items. For example, a disposable v. a durable razor, a reusable sandwich tupperware container v. one ziploc baggie, 5 disposable juice boxes for one week v. 5 thermoses of bulk purchased juice. *Remind students to find the costs of all the items involved and to state what assumptions they had to make in order to perform the analysis.

Oregon Common Curriculum Goal:

Social Science: Social Science Analysis, Economics

- Define and clarify an issue so that its dimensions are well understood.
- Understand that resources are limited (e.g., scarcity, opportunity, cost).

Math: Statistics and Probability

- Interpretation of Data: Read, construct and interpret displays of data.

Grade 5 Benchmark:

- Examine an event, issue, or problem through inquiry and research.
- Understand that all economic choices have costs and benefits, and compare options in terms of costs and benefits.
- Collect, organize, display, and analyze data.
- Identify how citizens can make their voices heard responsibly in the political process.

Worksheet: Buyer's Choice

Student Name:____

Oregon Department of Environmental Quality's
1998 Waste Composition Results

Total Paper in the waste stream	**24.35%**
Paper Packaging	**11.98%**
Other Paper	**12.37%**
Total Plastics in the waste stream	**10.45%**
Plastic Packaging	**5.33%**
Other Plastic	______
Total Metals in the waste stream	**7.31%**
Metal Packaging	______
Other Metal	**5.78%**
Total Glass in the waste stream	**2.77%**
Packaging Glass	______
Other Glass	**1.14%**
Total Packaging in the waste stream	**21.86%**

1. Fill in the blanks in the table above. (Hint: use the total of each category to find the difference).
2. Who is the author of the information in the table above? Which year was the data compiled?

____

3. Which material makes up the largest portion of the waste stream?______________________

4. Which packaging material is least commonly found in the waste stream?__________________

5. Round each number in the table to the nearest ones place. Use these rounded answers to make a graph illustrating how much these materials represent out of the entire waste stream. (For example, Total Paper would round to 25% and would be 25% out of 100% of the entire waste stream). Also include a place on your graph that will illustrate how much total packaging makes up the entire waste stream.

6. Name one thing that you buy that comes in each type of packaging listed above. In each case, write whether or not the packaging for that product is recyclable or reusable. (yes or no).

1.____

2.____

3.____

4.____

At Home Investigation:

Dear Parent:

Your child is learning about consumer choices and the impacts on the environment. This includes concepts about what types of packaging products come in, whether or not the packaging is recyclable and/or reusable, and whether or not the product is durable or disposable. By becoming aware of these concepts, your child will be better able to make informed choices as he or she grows older. Help your child understand your reasons for choosing each product. Reasons might include: on sale, best value, convenience, preferred brand, best quality, etc.

Instructions: Use items in your house to fill in the following survey.

Name of Product	Durable	Disposable	Recyclable	Reusable	Reason for Choosing
	y/n	y/n	y/n	y/n	

Buyer's Choice Postcards

Dear ______________________________,

I want you to know that I like your product ____________________,

but I wish it came in a package that:

- ☐ **Is made from recycled materials**
- ☐ **Is recyclable**
- ☐ **Has less packaging**

LEAVE LESS BEHIND
FOR THE FUTURE

Other Comments: ______________________________

____

Sincerely yours, ______________________________.
(Name) *(Address)*

Dear ______________________________,

I want you to know that I like your product ____________________,

but I wish it came in a package that:

- ☐ **Is made from recycled materials**
- ☐ **Is recyclable**
- ☐ **Has less packaging**

LEAVE LESS BEHIND
FOR THE FUTURE

Other Comments: ______________________________

____

Sincerely yours, ______________________________.
(Name) *(Address)*

Glue or photocopy postcards onto heavier stock paper and address the back to the manufacturer, be sure to include your return address and stamp.

Lesson: Packaging - The Good, the Bad, and the Ugly!

Grade: 4-5
Subject: Science, English
Objectives:
Students will:

- recognize natural resources in packaging
- identify the different purposes for packaging
- decide if packaging is necessary and appropriate

Teaching Time: Intro 15 minute discussion, home assignment then on a following day about 45 minutes

Materials: ONE WEEK PRIOR to this activity, ask students to complete the worksheet listed below and then bring to school several examples of packaging from home. Examples of packaging: frozen food, dry food, drink containers, toys, health care, and household items such as: light bulbs, or cleansers. Teacher should also collect a variety of packages. Try to find examples of similar products where one is "over-packaged" and the other is more environmentally friendly.

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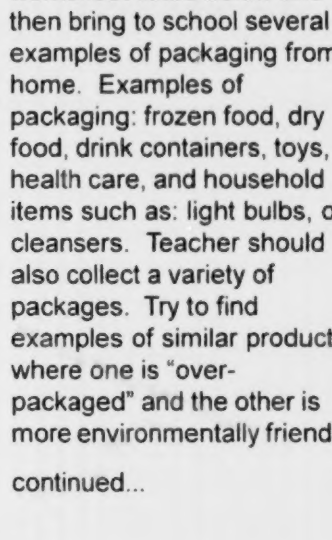

Background:

In the past, packages were refillable and reusable, such as thick glass bottles and cotton flour sacks. Today, in our society, almost 90% of manufactured packaging becomes solid waste and it makes up about 22% of the materials in the landfill. While packaging is important to the longevity of some food products, as well as to the safe transportation of many products, much packaging is excessive and does not show sensitivity to environmental issues in its development or processing. By understanding the factors that affect packaging choices by companies for their products, students will have the background necessary to make wise choices. (Prerequisite: Buyer's Choice).

Procedures:

- Ask students to bring in samples of packaging that they would consider good and bad from their homes. (Note: Provide a short background discussion of overpackaging, single use packaging and reusability and recyclability to get students thinking. If students are bringing in empty packaging, remind them to include all packaging that came with the product, such as the plastic film wrapping on the outside).
- Bring models of bulk items inside tupperware or used yogurt containers, etc. in order to demonstrate how this packaging alternative works just as well as choosing a single use item for convenience.
- Choose some packaging examples from the students and discuss as a group the purposes for packaging. **What type of material is this packaging? What natural resource does it come from? What purpose does it serve? Some purposes are: protects the product, identifies the product, gives directions, prevents theft, attracts attention. However, some packaging can give a false impression that the product is bigger, better, or more fun than it really is.**
- The packaging material used for a product can make it easier or harder to reuse or recycle--which usually means it will go in the trash! Packages made from two types of materials combined are not really recyclable in most cases because the materials cannot be easily separated. For example, some potato chip bags are made from plastic and aluminum foil. Gum wrappers can be made of paper combined with aluminum foil. Also, some products use more packaging than is really necessary. For example, bananas placed on a foam tray and shrink wrapped or individual servings of crackers, meat and cheese packaged into one 'meal'.
- Divide class into groups to examine and discuss the pros and cons of the examples of packaging brought from home.
- Assign the "Buyer's Economics Worksheet" as a take home project.

Reflection/Response:

- Have each group present an example good packaging (reusable, recyclable, not excessive) and an example of poor packaging (non-recyclable material, excessive). Students should discuss each group.

- Reflect on ways students and their families can help reduce waste from packaging. Some examples would be: buy in bulk instead of individual packages, carry items to school in reusable containers instead of disposable or individual containers, recycle packaging whenever possible, and don't buy products with excessive or nonrecyclable packaging.
- Have students write a real or imagined letter to a store owner or manager persuading him or her to reduce the number of products with poor packaging on the shelves and carry more products designed to be environmentally friendly.
- Have students write a real or imagined letter to the manufacturer of one of their favorite products asking them to switch to recyclable materials or to suggest an alternate packaging design that is more environmentally friendly. (If desired, use the postcard format included in the Lesson: Buyer's Choice).

Extensions:

- Use examples of the packaging to create a school bulletin board demonstrating the concept of good v. bad packaging. (See Natural Resource Bulletin Board example in the Resource section).
- Handout the Extension "No Waste Lunch" (see Resource section) and have students practice a no waste lunch over the next few weeks or months. Share experiences with the class. Was it easy or hard? What did they do differently? What substitutes did they have to make?
- Have students make a No Waste Lunch Display in the cafeteria to educate others.

Oregon Common Curriculum Goal:

English: Writing

- Use a variety of modes (e.g., narrative, imaginative, expository, persuasive) in

Social Science: Economics, Analysis

- Understand that resources are limited (e.g., scarcity, opportunity, cost).
- Define and clarify an issue so that its dimensions are well understood.

Career Related Learning: Problem Solving

- Develop and use productive and socially responsible approaches for resolving problems in family, school, community, and workplace settings.

Grade 5 Benchmark:

- Write in a variety of modes (e.g., narrative, imaginative, expository, persuasive) and forms (e.g., essays, stories, reports) appropriate to audience and purpose.
- Understand that all economic choices have costs and benefits, and compare options in terms of costs and benefits.
- Examine an event, issue, or problem through inquiry and research.
- Explain characteristics of an event, issue, or problem, suggesting possible causes and results.
- Examine alternative decisions and their impact on individuals.

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(Alternative:) collect pictures from newspapers and magazines of products (instead of the actual packaging); worksheet, "Buyer's Economics"

(Optional:) Video: "Times A Wasting: Garbage and Recycling in Oregon" (show students the latter portion of the video that show smart shoppers making good packaging choices). See Resource section for availability.

Worksheet: Buyer's Economics

Student Name____

Carry this worksheet to the grocery store on your next trip. Pick one type of product (like juice or shampoo) and compare the various brands and choices of packaging available for that product, then answer the questions on this worksheet. Put a star next to the product that you would buy. It is important to realize that product quality and price are sometimes factors that we don't want to compromise. However, by comparing products to one another, it may be possible to substitute one brand for another and reduce our impacts on the environment at the same time. You should take a calculator to the store to make it easy to compute the cost of the items. Be sure to divide by weight.

Name of Product	Recyclable (Y / N)	Reusable (Y / N)	Cost / Weight	Where Is It From?	Excess Packaging (Y / N)	Environmentally Friendly (Y / N)

Lesson: Potato Ways

Grade: 4-5
Subject: Math, Social Science
Objectives:
Students will:

- compare and contrast the price per pound of products to the amount of waste they generate
- analyze the positive and negative aspects of packaging

Teaching Time: 30 minutes for discussion, 25 minutes for calculations

Materials: transparency, "A Spud By Any Other Name"

Background:

Although packaging is useful and necessary for many reasons, it is a major component of the waste stream. People can reduce the amount of garbage they generate by making thoughtful and informed choices when they buy packaged products. (Prerequisite: Buyer's Choice or The Good, The Bad, and The Ugly!"). Additionally, students should realize the connection between their purchases and the decisions product manufacturers make. Because manufacturers try to meet consumer demand, avoiding unenvironmentally friendly products helps shift the curve towards more responsible, sustainable products.

Procedures:

- Assign the worksheet "A Spud by Any Other Name."
- **Which forms of the potato seem to be most highly processed?**
- **Which forms are most expensive per pound?**
- **Which form of potato would you purchase if you were interested in reducing solid waste? In saving money?**
- **What relationships are there among cost, amount of processing, and packaging of products?**
- **Actually, for every $10 that you spend at the grocery store, about $1 is used to pay for the package. Remember that you pay for the package, then you take it home and throw it in the garbage--which you also have to pay for! Therefore, it makes sense to only buy the amount of packaging that you need!**

Reflection/Response:

- Review the trade-offs of packaging. (Remember some of the drawbacks are: packaging increases the cost of the product, most packaging ends up in a landfill, some packaging becomes unsightly litter and can injure wildlife, packaging can make a product look bigger and better than it really is, and natural resources are used to make packaging. On the other hand, we need packaging to keep some things fresh, to protect them from breaking, to tell us how to use the item, etc.)
- Reflect that nature's way of packaging does not have to create waste. Examples are bananas, apples, oranges, peanuts, coconuts - all come in their natural "wrapper" and can be purchased without other packaging and these items are useful in composting. Natural items can be composted or "broken down" by nature and provide nutrients back into the soil.
- Write the following on the board, but in a different order from the correct one below:
  *No packaging
  *Refillable (or reusable) packaging made from recycled products
  *Packaging that is reusable
  *Packaging made from recycled products and is recyclable
  *Packaging that is made from recycled products
  *Packaging is not more than necessary, but not reusable or recyclable

REDUCE
REUSE
RECYCLE

- Ask students to rate these choices in order of least wasteful to most wasteful and explain their answers.

Extensions:

- Have students make informative posters that recommend careful selection of food products. Include such ideas, for example, as: choose products in recyclable, returnable, or refillable containers, avoid excessive packaging, buy products in bulk and in larger sizes, buy unwrapped fruits and vegetables, avoid snack items in single-serving packages, carry products home in cloth or string bags, support companies that provide minimal and recyclable packaging.
- Hand out the Extension "No Waste Lunch" (in the Resource section) and ask students to practice this several times over the next few weeks or months and share their experience with the class. Was a "No waste lunch" easy or hard? What changes did they have to make? What favorite items did they give up? What substitutes did they use instead?
- Have students create a cafeteria display of a "waste-less" lunch that uses durable containers inside a lunch box and a refillable thermos, etc.

Oregon Common Curriculum Goal:

Mathematics: Measurement
- Determine and use appropriate standard and nonstandard units and tools of measurement to measure to the degree of precision and accuracy desired in particular situations

Social Science: Analysis
- Define and clarify an issue so that its dimensions are well understood

Content Standard:

- Determine appropriate units, tools, and techniques to measure to the degree of precision and accuracy desired in particular situations.
- Gather, use, and evaluate researched information to support analysis and conclusions

Grade 5 Benchmark:

- Students will use the following units: weight—ounce, pound, gram, kilogram, ton
- Examine an event, issue, or problem through inquiry and research.

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Worksheet: A Spud By Any Other Name

Product	Package Size	Price	Price/Pound (lb.)[1]	How Packaged
Fresh russet potatoes	5 lb.	$ .99		Plastic bag
Fresh russet potatoes	10 lb.	$1.69		Plastic bag
Fresh russet potatoes	4 lb.	$1.00		Bulk
Canned potatoes - sliced	15 oz.	$ .75		Can (steel)
Canned potatoes - whole	15 oz.	$ .75		Can (steel)
Tater tots - frozen	32 oz.	$2.85		Plastic bag
Tater tots - frozen	5 lb.	$5.55		Plastic bag
Mashed potatoes - frozen	22 oz.	$2.39		Plastic bag
Hash brown patties - frozen	24 oz.	$2.39		Cardboard box
Hash browns (southern style) - frozen	32 oz.	$2.79		Plastic bag
French fries (crinkles) - frozen	32 oz.	$2.75		Plastic bag
Shoestring potatoes - frozen	20 oz.	$2.17		Plastic bag
Potato chips	9 oz.	$2.09		Plastic bag
Potato chips	14 oz.	$2.99		Plastic bag
Instant mashed potato buds	5.5 oz.	$ .99		Cardboard box
Instant mashed potato buds	13.75 oz.	$2.45		Cardboard box
Instant mashed potato buds	1 lb. 12 oz.	$3.75		Cardboard box

1 lb. = 16 oz.

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[1] Prices gathered in Lakeport, California on July 25, 1997.

Source: California Integrated Waste Management Board: *Closing the Loop: Exploring Integrated Waste Management and Resource Conservation K-6* (2000)

Lesson: Second Time Around

Grade: 4-5
Subject: Art, English, Science
Objectives:
Students will:

- participate in two skits about reusing materials and write additional parts to the skits, if desired
- recognize the benefits of reuse
- develop ways to reuse a variety of products

Teaching Time: 50-60 minutes

Materials: copies of skits "The Funnels" and "Jobs for Bags" (see Resource section); two funnels (available at an auto supply store or simply made from the tops on plastic bottles); 3 paper brown paper bags

REDUCE
REUSE
RECYCLE

Background:

Some products can be easily reused to extend their use, therefore reducing the amount of solid waste to be placed in landfills. Reuse conserves natural resources more than recycling because when an item is reused, it does not need to be collected by a recycling company, and energy will not be needed to make a new product. It is important to remember that even though recycling saves resources and energy, the transportation and production still creates pollution. Thus, moving one step up the "Oregon Waste Hierarchy" (see the transparency in Lesson: "There is No Away") to reuse is a more sustainable behavior.

Procedures:

- **Have you ever known of something to be rescued from the trash and used again?** Students might recall that instead of throwing clothes in the trash they were given to someone else, and a toy or tool might have once been fixed, cleaned up, and then used again.
- Today we our going to read and act out two plays that will tell us something about reuse.
- Have students read and act out one or both plays: "The Funnels" and "Jobs for Bags."

Reflection/Response:

- **What is the meaning or the message being conveyed from each of these plays? What do we gain by reusing materials? (Less trash ends up in the landfill, and energy and natural resources are conserved, even more than when recycling.)**
- **What types of things do people throw away that can be reused?** Examples are: plastic containers, clothes, books, furniture, toys, games.
- Assign students to work in teams or groups. Have each group develop a suggestion list for ways to reuse items around their classroom, at school, or at home. For each item that is being reused, identify the natural resource that is being conserved with each reuse. (See Lesson: "Our Natural Resources").

Extensions:

- Ask students to write additional scenes to one of the skits, or they can write their own skit.
- Present the skits to another class or at a school assembly.
- Create a school donation box, if you don't already have one, for items that could be used in art/drama classes. Ask students to bring in items from home to donate and host a school-wide swap meet or clothing drive.

- Using a donated item that would have been thrown away, make something out of the item so that the item will be reused. Write a description of the item and bring the item to class to share. For example, make a toy or costume out of reused materials or artwork from discarded materials. (See Extension: Let's Make an Animal Mask in the Resouce section).

Oregon Common Curriculum Goal:

Arts: Create, Present, and Perform

- Express ideas, moods and feelings through various art forms.

English: Reading

- Demonstrate evaluative comprehension of a variety of printed materials.
- Connect reading selections to other texts, experiences, issues and events.

Science: Science in Personal and Social Perspectives

- Describe how daily choices of individuals, taken together, affect global resource cycles, ecosystems, and natural resource supplies.

Grade 5 Benchmark:

- Apply artistic elements and technical skills to create, present and/or perform works of art for a variety of audiences and purposes
- Analyze and evaluate information and form conclusions.
- Extend and deepen comprehension by relating text to other texts, experiences, issues, and events.

Be Creative, Reuse

Artwork by Ashlee Commeree, 7th Grade, Archbishop Howard Catholic School. Submitted to Metro Regional Services Earth Day Bill Board Contest, 2001. (Honorable Mention).

Lesson: We Can Recycle

Grade: 4-5

Subject: Science, Social Science

Objectives:

Students will:

- understand the role consumers play in "closing the loop" by purchasing recycled products
- identify the parts and meaning of the universal recycling symbol
- learn about recycling in their community

Teaching Time: 30-40 minutes

Materials: transparencies, Recycling Symbol: the Chasing Arrows and Closing the Loop with Recycled Paper Products; worksheets, My Family Can Recycle and Save These from the Garbage Can!; drawing paper; pens, markers, etc.

Vocabulary:
pre-consumer content
post-consumer content

REDUCE
REUSE
RECYCLE

Background:

This lesson will introduce recycling as part of a man-made cycle and will discuss the importance of buying products with recycled content in order to support recycling markets. Remind students of the natural cycles that were discussed in "Our Natural Resources". People often ask why certain types of materials are not recyclable in their community. Whether or not a city or county recycles certain materials depends on a mix of factors like the ability reasonably resell the materials to an end user, the total distance to that market, the technology available and associated costs. For more information on what happens to materials once they leave your home, read "The Recycling Process After Collection" in the Resource section.

If you do not already thoroughly understand what can and can't be recycled in your community, contact your city or county solid waste management department or department of public works so that you can help students correctly fill out their worksheet "My Family Can Recycle."

Procedures:

- **Who knows what a "symbol" is?**
- Symbol: something that represents something else by association, resemblance, or convention; especially, a material object used to represent something invisible.
- **Can you name some symbols that are common in our lives?** Students should know that a symbol is a visible sign that often stands for something, even if that thing is invisible. Examples include: the flag-our country, the Star of David-Judaism, a cross-the Christian religion, a peace sign-peace, a lion-courage, and advertising logos-a manufacturer.
- **Can anyone come up to the board and draw the symbol for recycling?**
- Now show the transparency, "Recycling Symbol: the Chasing Arrows."
- Discuss the different parts of the symbol. Carefully review with the students the difference between "recycled-content" and "recyclable."
- **Can these symbols be a bit confusing?** Yes, it might be assumed that an item is made from recycled materials, whereas the symbol is only indicating that it could be recycled!
- **Some people believe that if a recycle symbol is on the package of a product that the product is automatically able to be recycled. However, this is also not true. In different communities and different parts of Oregon, some materials are collected, but others are not. In order to know how to recycled properly, we have to call our city or county solid waste management department in order to know what we can and can't recycle!**
- **Let's take turns naming the materials that we collect in our community.**
- **Another important part of recycling is buying products that contain recycled-content. Who knows why this would be important?** See what kind of responses the students give, and then help them understand that if people didn't buy the products with

recycled-content, the materials that we put in our curbside bin or take to the recycling depot would have no value at all. By buying paper with recycled-content, for example, we create a DEMAND for that type of product. **On paper products and some plastic bottles, we have to look for the words "post-consumer content". Consumer--that's you! And "post" means after you've used and recycled the product to be made into something new. Some materials, like newspapers, glass bottles, aluminum cans and steel (tin) cans, all have some recycled-content in them, even though the labels may not tell you so.**

- Show the transparency, "Closing the Loop with Recycled Paper Products." Use the transparency to review that "the loop" is broken when products are taken to the landfill.

*This lesson is a great opportunity to invite a guest speaker to speak about recycling and solid waste management in your community. (See Field Trip Guide to find out about opportunities in your area).

Reflection/Response:

- **What happens to a recyclable item that is placed in a landfill instead of being recycled? It is buried and the natural resources used to make it are lost.**
- **Why are they lost, can't they decompose inside the landfill and go back into the earth? Generally, no. There is very little air and no sunlight that allows decomposition to take place.**
- **Why is it important to keep items in the recycling loop? To conserve natural resources for future generations.**
- **How can we keep natural resources in the loop? Always recycling whatever we can, buying recycled-content products, composting, practicing waste reducing behaviors, etc.**
- Complete the worksheets "My Family Can Recycle" and "Save These From the Garbage Can!"

Extensions:

- Ask students to find five items in their homes that are made from recycled-content materials. For example, they can examine cereal boxes or other cardboard boxes that contain dry food and look for the label that indicates that the box is made from recycled materials, other products would be paper egg cartons, newspapers, brown bags from the grocery, aluminum cans, some types of plastic bottles.
- Have students share their homework assignments.

Oregon Common Curriculum Goal:

Science: Unifying Concepts and Processes

- Apply foundation concepts of change, cycle, cause and effect, energy and matter, evolution, perception, and fundamental entities.

Social Science: Economics

- Understand that resources are limited (e.g., scarcity, opportunity, cost).

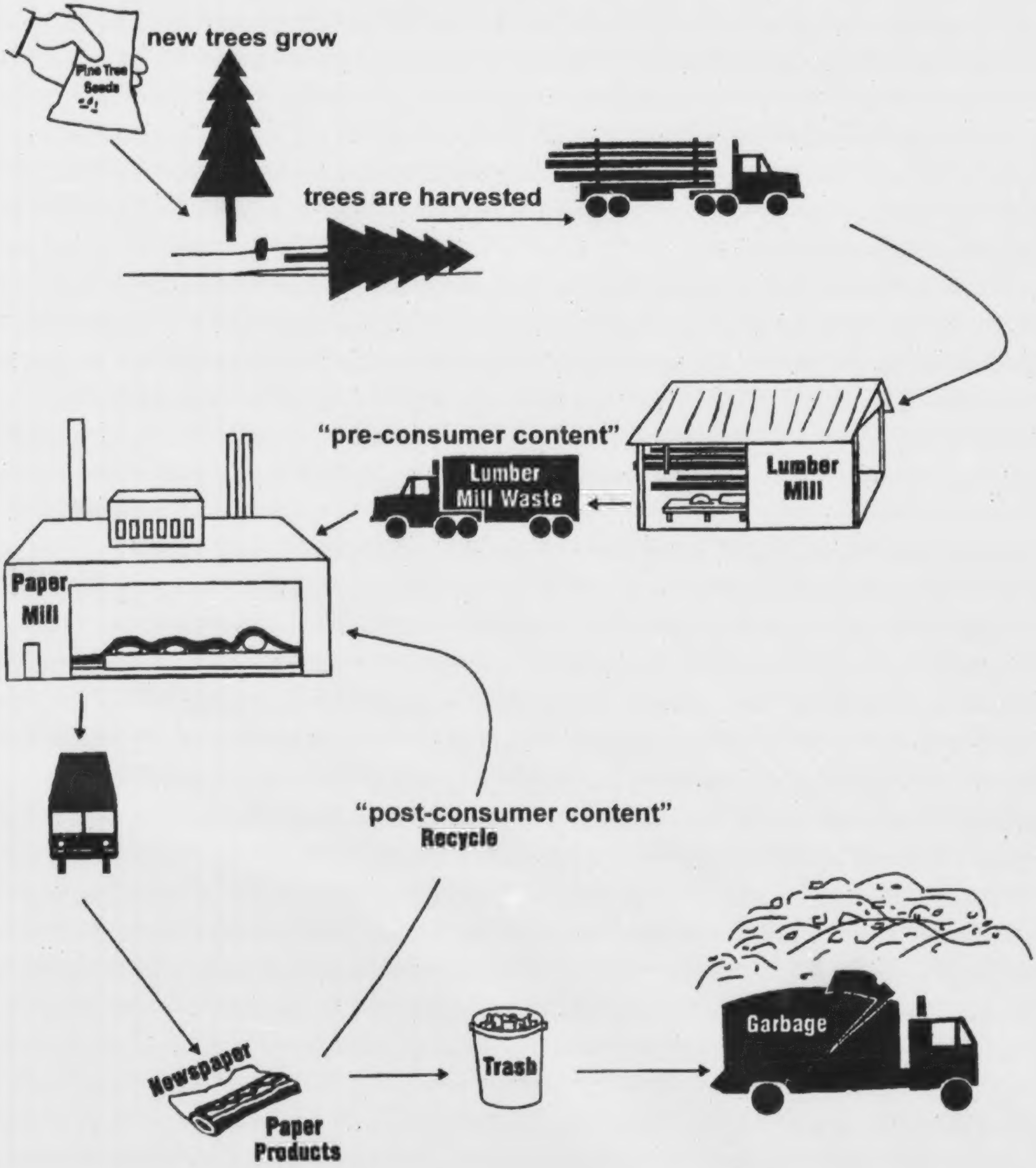
Grade 5 Benchmark:

Students will:

- Recognize and describe cycles in natural and man-made systems.
- Understand that all economic choices have costs and benefits, and compare options in terms of costs and benefits.
- Understand how supply and demand influence price, and how price increases or decreases influences the decisions of consumers.

Overhead: Closing the Loop

Closing the loop with recycled paper products.

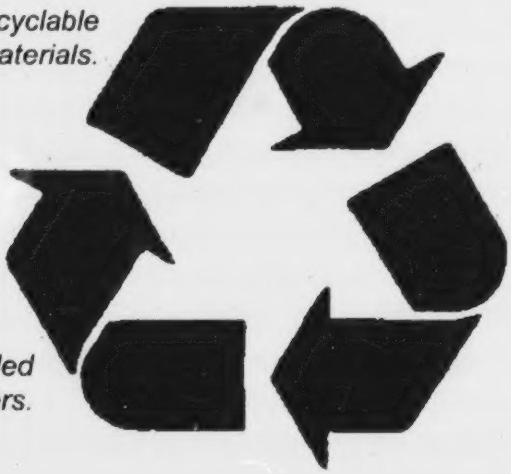

Pine Tree Seeds
new trees grow
trees are harvested
"pre-consumer content"
Lumber Mill Waste
Lumber Mill
Paper Mill
"post-consumer content"
Recycle
Newspaper
Paper Products
Trash
Garbage

Post-consumer paper fibers get recycled numerous times before they become "waste" paper products like tissue or toilet paper because the fibers are so short they cannot be recycled any longer.

Source: California Integrated Waste Management Board: *Closing the Loop: Exploring Integrated Waste Management and Resource Conservation K-6* (2000)

Overhead: Recycling Symbol - The Chasing Arrows

This is the universal symbol for recycling. The three arrow design represents a never-ending process: the three phases of recycling. If you look carefully, you can see the outline of a tree in the center of the symbol.

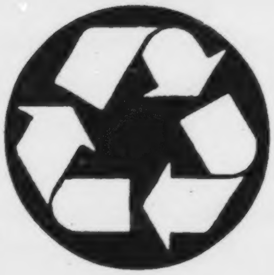


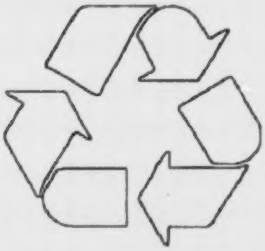
Collection of recyclable materials.

Re-manufacturing into new products.

Purchase of recycled products by consumers.

Recycled: This symbol identifies products and packages that are made at least partially from material that has been used before, i.e. "post-consumer waste", which is waste from your home, school, or office. These products also usually contain "pre-consumer waste" fibers, such as wood waste scraps from a timber mill.



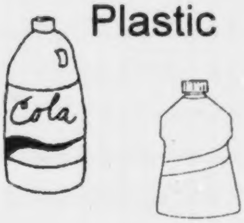


Recyclable: This symbol identifies products and packages that can be recycled, if markets exist in your community or region. In other words, it can be sorted from your garbage, collected by your local recycler, and made into a new product.

Keep in mind that a product can be both recyclable and recycled, like the paper used to print these activities. It contains 50% post-consumer recycled waste paper and 50% unbleached pulp. It can also be made into new paper if you recycle it again.

Worksheet: My Family Can Recycle

Dear Parent: your child has been learning about recycling as a way to conserve natural resources, help manage the garbage problem, and reduce pollution. The following list shows what can be recycled in this community. Please keep it as a guide if you do not already have one.



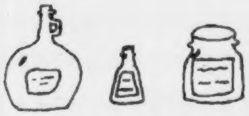
Plastic

☐ rinse, flatten

☐ no caps

☐ numbers 1 2 3 4 5 6 7 (circle the numbers that can be recycled in your community)

Glass



☐ mix all colors together

☐ recycle metal lids

☐ separate clear brown green (circle the colors that are separated)

Metal

☐ rinse, remove label (recycle label with scrap paper)

☐ flatten, remove ends

☐ do not remove ends

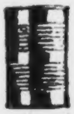
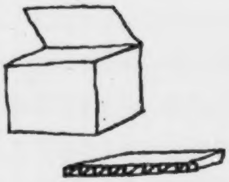


Illustration by [illegible]

Motor Oil

☐ take to an authorized collector (auto store, gas station, service center)

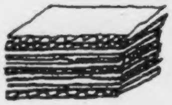
☐ at curbside, in a container with a tight fitting lid



Cardboard

☐ flatten

☐ no pieces larger than ______________



Scrap paper (mixed paper)

☐ writing paper, mail

☐ grayboard (cereal boxes, egg cartons, etc.)

☐ no wax coated papers (freezer containers, etc.)

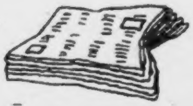
☐ separate from newspaper

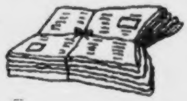
Newsprint

☐ bundled

☐ not bundled

☐ include magazines with newspaper



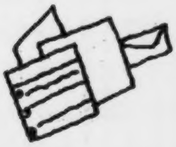


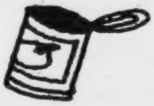
The ______________________________ Family Recycles! Because we want Oregon to remain a beautiful place to live, our family pledges to recycle as much as we can, as often as possible.

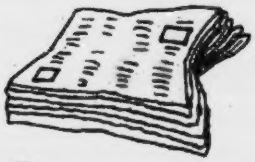
Worksheet: Save These From The Garbage Can!

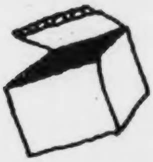
Student Name:____

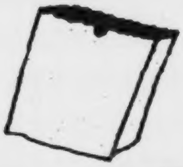
Draw a line from the things going into the garbage to the right place where they would be recycled. Draw a line to the art project box if they item could be reused before recycling.

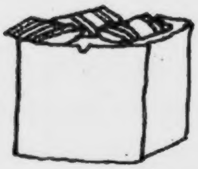


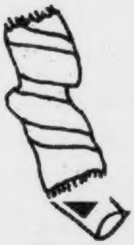


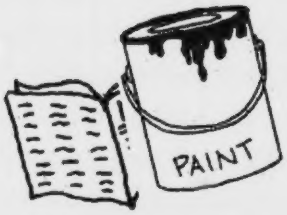


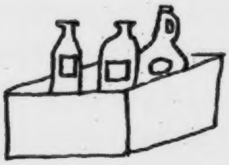


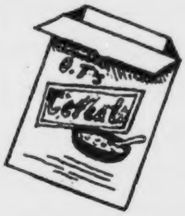


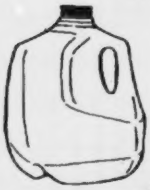


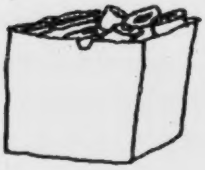


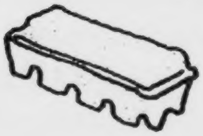


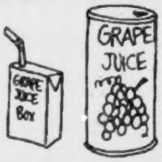


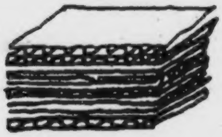


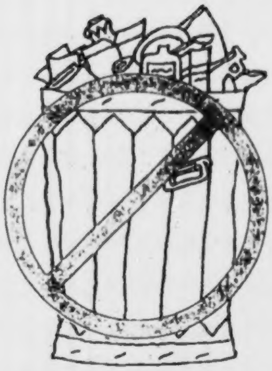


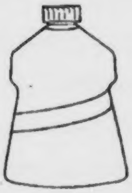


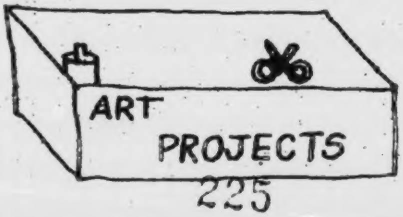



GRAPE JUICE Box
GRAPE JUICE








ART PROJECTS

DEQ

Lesson: Popular Paper

Grade: 4-5
Subject: Math, English
Objectives:
Students will:

- explain the benefits of recycling paper and using fewer natural resources
- calculate answers to a variety of paper-production math problems
- understand the connection between natural resources used in manufacturing and recycling and the waste associated with each process

Teaching Time: Intro discussion 15 minutes, Daily weighing and data collecting 10 minutes, return to lesson after 1 week: 45 minutes

Materials: transparency, Don't Throw Your Trees Away; bathroom scale; worksheet, Paperwise Math;

(Optional:) video: Lifecycle of Glass and Paper (see Resources section for availability)

Lesson concept: Association of Vermont Recyclers: *Teacher's Resource Guide for Solid Waste and Recycling Education* (1999).

REDUCE
REUSE
RECYCLE

Background:

The single largest component of solid waste is paper. Americans consume more paper per person that any other nation in the world. Each person in the United States uses approximately 600 pounds of paper annually (the equivalent of two harvestable trees). Most wood used to make paper comes from "tree farms", but about 1/3 still comes from private and public forests. About 28% of the wood used to make paper is the wood scrap or "waste" from timber mills. This is also called "pre-consumer waste" because instead of being thrown away, it is used to make paper products. Individuals are the first links in the paper recycling process. By reusing and recycling paper we can help conserve resources (i.e. trees, water), protect the environment and reduce energy use. The paper we recycle that goes back into paper products is called "post-consumer waste." If you see this term on a product label, you know that you have helped "close the loop" in the recycling process. (See "Close the Loop" overhead in the Lesson: We can Recycle).

In 1999, people in the U.S. recycled 45% or 47.3 million tons of paper (American Forest & Paper Association). Each ton of paper that is recycled replaces and preserves 13 to 20 five hundred pound, harvestable pulpwood trees (trees grown for paper production). Making paper from recycled fibers uses 30-55% less energy than making paper directly from trees and reduces air pollution from the manufacturing process by 95%.

Procedures:

- Use the transparency, "Don't Throw Your Trees Away" to discuss paper recycling and as an opportunity to present some of the information in Background. Note how throwing paper in the trash breaks the cycle!
- For one week, have students collect the classroom paper they normally would throw away. (Or if your class already recycles, use the measurements to calulate your resource savings over time). Divide the collected discarded paper into two boxes: paper we can still use, paper we have used completely.
- Weigh the paper each day. Construct two graphs showing daily weights. One measurement you can use to demonstrate waste is: 500 sheets of paper in a ream or 3,000 sheets a foot. (36 reams = 6 ft.).
- Have students calculate the number of reams they saved over time (weeks, months, years) by reusing and recycling. When you get to one ton, you have saved about 17 trees.
- At the end of the week compare the two graph results. **Could we have used less paper? How can we reduce the amount of paper we use?** Students may cleverly suggest that teachers could assign less work! Generally, using both sides of the paper and making scratch pads out of discarded paper are very achievable habits.
- After the students have collected data on the amount of paper generated, have them calculate the amount of paper generated per person in the classroom. Now calculate what the school's annual paper generation rate is for an entire year based on this number.

- (Optional:) Show the video Lifecycle of Paper (it is just after the segment on glass).

Reflection/Response:

- Have students write a scientific report outlining the steps they had to perform in this lesson as if it were a replicable scientific experiment for another classroom. Students should include their observations and conclusions in the final section of the report.
- Assign the Paperwise Math worksheet. Have students create their own problems/answers using the given data.

Extensions:

- Working with a partner, make two lists: first, list all the paper products you use at home: and second, list substitute products to use in place of paper products.
- Make recycled paper (see Extension: Papermaking in the Resource section)
- Create a poster that encourages people to recycle paper.
- Give a speech or write an essay explaining the merits of recycling, reduction, and reuse of paper or have students write an official school proclamation for the principal to sign declaring the school's efforts to conserve paper, double-side copy, etc. Refer to Oregon Green Schools Tools as a resource for extensions, available at: www.deq.state.or.us/wmc/solwaste/edu.html.
- Assign the Activity: Environmental Fortune Teller in the Resource section.

Oregon Common Curriculum Goal:

English: Writing

- Use a variety of modes (e.g., narrative, imaginative, expository, persuasive) in appropriate context

Mathematics: Calculations and Estimations

- Demonstrate conceptual meanings for addition, subtraction, multiplication, and division

Grade 5 Benchmark:

- Write in a variety of modes (e.g., narrative, imaginative, expository, persuasive) and forms (e.g., essays, stories, reports) appropriate to audience and purpose.
- Perform calculations on whole numbers, fractions, and decimals using paper and pencil and calculators.

PAPERWISE MATH ANSWERS

1. 3,688 X 19 = 70,072
X 32 = 118,016
X 67 = 247,096
X 85 = 313,480

2. tens: 70,070; 118,020; 247,100; 313,480

hundreds: 70,100; 118,000; 247,100; 313,500

thousands: 70,000; 118,000; 247,000; 313,000

ten thousands: 70,000; 120,000; 250,000; 310,000

3. 17 X 19= 323

4. four X 32 = 544

5. 24,000 divided by two
X 67 = 1,139

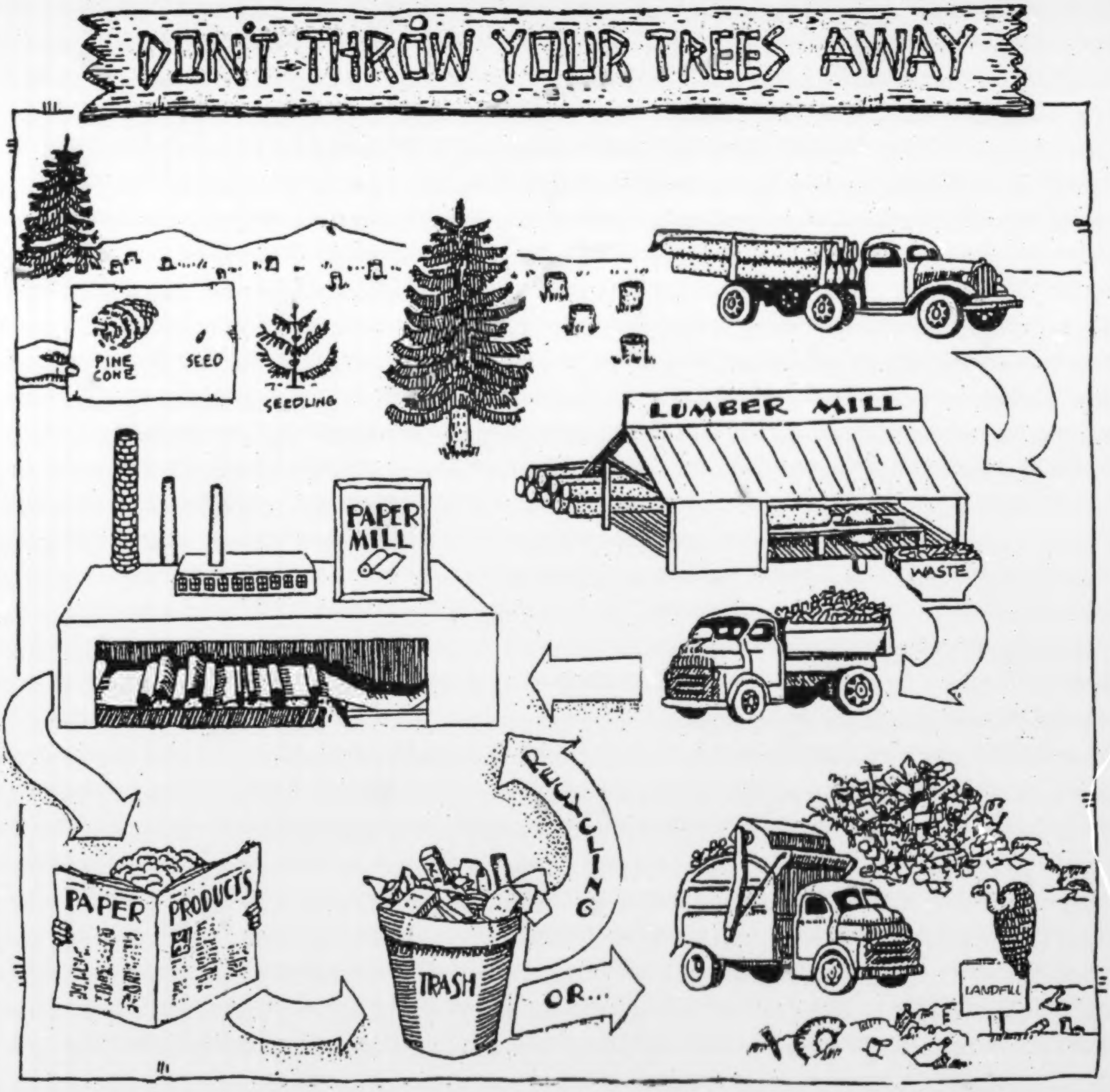
6. eighty-eight
X 85 = 1,445

7. three

8. 68,000,000 and sixty-eight million

9. 84+36+176 = 296 pounds

Overhead: Don't Throw Your Trees Away


DON'T THROW YOUR TREES AWAY
PINE CONE
SEED
SEEDLING
LUMBER MILL
PAPER MILL
WASTE
PAPER PRODUCTS
TRASH
RECYCLING
OR...
LANDFILL

Source: Association of Vermont Recyclers: *Teacher's Resource Guide for Solid Waste and Recycling Education* (1999)

Worksheet: Paperwise Math

Student Name:____

Producing one ton of paper from virgin statistics:

- 3,688 lb. of wood
- 216 lb. of lime
- 360 lb. of salt cake
- 76 lb. of soda ash
- 24,000 gallons of water
- 28 billion BTU's of energy

The process also produces:

- 84 pounds of air pollutants
- 36 pounds of water pollutants
- 176 pounds of solid wastes

Recycling one ton of paper yields the following fiber requires the following resources:

- Saves about 17 trees from being harvested
- Saves 3 cubic yards of landfill space
- Uses 50% less water in the processing
- Saves 96 gallons of gasoline
- Saves 380 gallons of oil
- Prevents 2.5 tons of Carbon Dioxide from being released (a green house gas)

- Creates 74% less air pollutants
- Creates 35% less water pollutants
- Uses 60% less energy in production

Paper Facts:

*There are 500 sheets of paper in a ream. It takes six reams to make one foot.

*Junk mail destroys about 68 million trees per year.

1. How many pounds of wood would be needed to make 19 tons of paper? 32? 67? 85?

2. Round your answers above to the nearest tens place, hundreds place, thousands place, and ten thousands place. Write your answers in the table.

TENS	HUNDREDS	THOUSANDS	TEN THOUSANDS

3. How many trees would you save by RECYCLING 19 tons of paper? 32? 67? 85?

4. How many tons of paper would you have to recycle in order to save 12 cubic yards of landfill space?

3 x ? = 12 ___________tons of paper.

5. Which is the correct operation for the following question?
If producing one ton of virgin paper uses twenty-four thousand gallons of water, and recycling one ton uses fifty percent less water, how many gallons of water does recycling save?

A. 24,000 minus 50
B. 24,000 plus two
C. 24.000 divided by 50%
D. 24,000 divided by two

6. How many pounds of solid waste are in one-half a ton of paper?

7. How many reams of paper would there be in 18 feet?

6 X ? = 18 ____________ reams of paper.

8. Write out the number 68 million in numeric form and in word form.

9. How many total pounds of pollutants are produced by virgin manufacturing?

10. List the reasons why you believe recycling paper is or isn't important.

Lesson: All About Aluminum

Grade: 4-5

Subject: Science, English (extension activity)

Objectives:

Students will:

- use magnetism, appearance, and mass to differentiate between aluminum, tinned, and bimetal cans
- complete a math worksheet on the properties of metals
- understand the connection between natural resources used in manufacturing and recycling and the waste associated with each process

Teaching Time: 50-60 minutes

Materials: for each group of 4 to 5 students: small magnets, samples of aluminum, tinned and bimetal cans (see Background for examples); pan balance, and gram weights; worksheet, (Continued...)

Lesson Concept: South Carolina Department of Health and Environmental Control: *Action for a Cleaner Tomorrow* (1996)

REDUCE
REUSE
RECYCLE

Background:

Metals have a very high rate of recycling across the nation when compared to other materials. Historically, metals have been conserved and recycled longer than other materials because they generally exist in large quantities such as car bodies and the various types of metals that are easy to identify and separate.

Steel is produced by adding carbon to iron and it is the most widely used and recycled metal today. Recycling Steel saves about 74% of the energy needed in virgin production.

Aluminum makes up 8% of the Earth's crust, the third most common element after oxygen and silicon. The energy saved by making aluminum cans from recycled aluminum is about 95%*. Not only does recycling conserve natural resources, but also recycling takes these materials out of the waste stream, reducing the amount of trash put into our landfills. (*Note: Teachers should also be aware that aluminum production uses a vast amount of energy compared to other types of packaging like paper or plastic and while the energy savings from recycling is good, it is still intensive and there are still pollutants created during the recycling process--as with recycling of all types of materials).

In this lesson, students will examine the properties of metal cans that they use every day. There are three general categories of metal cans: aluminum, tinned, and bimetal. Bimetal refers to a can with steel lids enclosing an aluminum body (some tuna cans, small juice cans, tennis ball cans, and many soda cans). Tinned cans are actually 99% steel with a thin coating of tin (soup cans).

Procedures:

- **Who knows what soda cans are made of?** Most students should answer aluminum. **Does anyone know what is special about aluminum? One special feature is that it is easily recycled. In fact, it can be recycled over and over again just like glass!**
- Today we are going to investigate the different kinds of metals used to make cans. We will record our findings on a table.
- Show the transparency, Metal Mania. Using the transparency, 3 cans (one of each metal-type), a magnet, a pan balance and gram weights, demonstrate how to identify the type of metal used in the can.
- Divide the class into groups of 4 or 5 and distribute the worksheet, "Discovering Metals" to each student. Set up stations in the room so that groups can practice separating cans by (a) using magnets, (b) observing differences in appearance and (c) weighing.

Reflection/Response:

- Review findings from procedure as a whole class.
- Have students complete the math problems on Discovering Metals individually.

Extensions:

- Visit the local recycling center.
- Challenge students to research the process of making aluminum cans and write a report. What raw material is used in making aluminum? Identify the geographic regions where the raw materials come from.

"Discovering Metals" (one per student); worksheet, "Facts about Metal"; transparency, "Metal Mania"

NOTE: This activity could be done as a whole group demonstration or individualized assignment.

Oregon Common Curriculum Goal:

Science: Physical Science: Force and Motion
- Understand fundamental forces, their forms, and their effects on motion

Mathematics: Calculations and Estimations
- Demonstrate conceptual meanings for addition, subtraction, multiplication, and division

Grade 5 Benchmark:
- Students will determine whether or not a magnet will attract a certain substance.
- Perform calculations on whole numbers, fractions and decimals using paper, pencils and calculators.

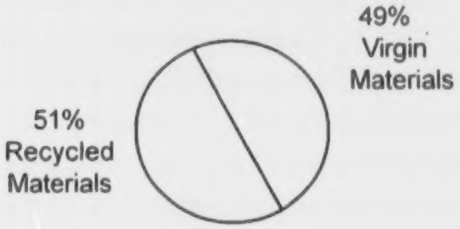
Answers to Discovering Metals

1. A. 95%-74% = 21% 95%- 34% = 61%

   b. 61% + 21% = 82%

2. Aluminum

3.



4. 156 hours in 6.5 days
   156/26 = 6 pounds of steel

5. 294 hours of television watching

Overhead: Metal Mania

Aluminum	**Bimetal**	**Tin (99%) Steel)**
Not attracted to magnet	Body is attracted, but lids are not	Attracted to a magnet
Bottom does not have a rim and has a finely brushed, polished appearance	Bottom has a rim and is not finely brushed or polished	Bottom has a rim
Body is shiny, silver and smooth with no seams	May or may not have seams	Body has rings or ribbing, always has a seam
Label is usually spray-painted on, and usually says "all aluminum can"	Usually spray painted	Normally has a paper label
Lightest weight	Heavier weight	Heaviest weight

Worksheet: Discovering Metals

Student Name: ____

Fill in the chart below. Write in yes or no or the word that corresponds to the property of the metal. Decide which type of metal the product is packaged in and write in the abbreviation in the column. (AL, BM, Tin)

polished	seams	ribbed	label type	magnetic ends	magnetic body	weight	can type

Worksheet: Facts About Metal

Student Name:____

- **Aluminum is extremely efficient to recycle.** It requires 95% less energy to recycle when compared to the virgin production of aluminum and produces 95% less air and water pollution. However, mining and producing virgin aluminum causes a lot of pollution, thus it is important to use it as wisely as possible.
- **Recycling one ton of aluminum**, is equivalent to not releasing 13 tons of carbon dioxide (a green house gas) into the air. In comparison, recycling one ton of newspaper is equivalent to not releasing 2.5 tons of carbon dioxide into to the air.
- **Aluminum that is recycled** makes it back onto the store shelf as another can in about six weeks. An aluminum beverage can contains an average of 51% recycled material.
- **Compared to the virgin production of steel**, recycling one pound of steel saves enough energy to power a 60 watt light bulb more than 26 hours. Recycling one aluminum can saves enough energy to run a television for 3 hours.
- **Recycling one ton of steel** reduces air pollution by 86% and water pollution by 76% and saves 74% energy and 40% of the water that would have otherwise been used. It also reduces the need for virgin materials by 90%.

The following resources are used to produce one ton of aluminum:

8,766 pounds of bauxite
1,020 pounds of petroleum coke
966 pounds of soda ash
327 pounds of pitch
238 pounds of lime
197 million BTUs of energy

The pollutants created are:

3,290 pounds of red mud
2,900 pounds of carbon dioxide (a green house gas)
81 pounds of air pollutants
789 pounds of solid wastes

1. a. If recycling paper produces 74% less air pollutants and 35% less water pollutants, what is the difference between each of these and the amount of air and water pollutants that recycling aluminum saves?

   b. How many more air and water pollutants does aluminum recycling save when compared to paper recycling? (Hint: add the two differences from the question above to get one total).

2. Recycling which material (aluminum or paper) helps prevent more green house gases?

3. Draw a pie chart to illustrate how much recycled material gets used in making a new beverage can. (Hint: the rest of the pie chart should indicate the amount of virgin aluminum still being used in production).

4. How many pounds of steel you have to recycle in order to have the light turned on for six and half days? (Hint: there are 24 hours in a day, find out how many hours are in 6.5 days, now divide this number by 26 hours to find out how many pounds of steel you will need.)

5. How long could you watch television if you recycled ninety-eight aluminum cans? Write out your answer in word form.

6. How much virgin steel is needed to produce new steel when one ton is recycled?

7. a. How many total pounds of resources are used to create one ton of aluminum?

   b. How many total pounds of pollutants are created by producing one ton of aluminum?

   c. How many million BTUs of energy are needed to create 5 tons of aluminum?

8. Create three of your own math problems using the information listed. Write them in word form and then diagram the mathematical operations needed to solve them. *Optional: solve the problems that you have created.

9. List the reasons why recycling metal is or isn't important.

Lesson: Get to Know Glass

Grade: 4-5
Subject: Science, Math, Writing (extension activity)
Objectives:
Students will:

- learn about the process of making and molding glass, and the energy and natural resources used in the process
- complete a math worksheet on the properties of glass
- understand the connection between natural resources used in manufacturing and recycling and the waste associated with each process

Teaching Time: 45 minutes

Materials: See "Making and Molding Glass Experiment;" worksheet, Get to Know Glass

(Optional:) video: Lifecycle of Glass (see Teacher Resource section for availability)

REDUCE
REUSE
RECYCLE

Background:

In 1971, Oregon was the first state to pass the Bottle Bill law which requires that all beer and carbonated beverage containers have a five cent deposit that is charged to the consumer and refunded when they are returned for recycling. This law helps 90% of these containers return for recycling--many of which are glass. In fact, only 3% of the materials going to the landfill in Oregon are made of glass.

In the past, a lot of glass containers were "refillable" which meant that they were sterilized, refilled and resold many times before being recycled. Even though a few dairy companies in Oregon still utilize this type of service, most manufacturers have stopped using this practice in the U.S. However, in Europe as much as 70% of glass containers are refilled.

Refilling glass containers is more efficient than recycling for a couple of reasons. First, glass generally has a low resale value to end users compared to all the types of materials currently being recycled. Clear glass is the most valuable and is often collected separately from colored (green or brown) glass. Second, because melting glass requires temperatures of 2500 degrees Fahrenheit, glass is very energy intensive to recycle. (Virgin glass production uses temperatures of 2800 degrees Fahrenheit, so there is still some energy savings in recycling).

Today, more and more uses for crushed glass (called cullet) are being found and utilized, like mixing it with asphalt for paving. Because glass is not hazardous to the environment but is heavy and costly to ship and energy intensive to melt, this makes it a good material to target for use in paving and as a "fill" in landscaping areas to improve drainage or create walkways.

Procedures:

- Follow the instructions for "Making and Molding Glass Experiment"
- Show the video the Lifecycle of Glass
- Have students write or illustrate what happens to glass when it is taken to the factory to be recycled.

Reflection/Response:

- Assign the "Get to Know Glass Worksheet"

Extensions:

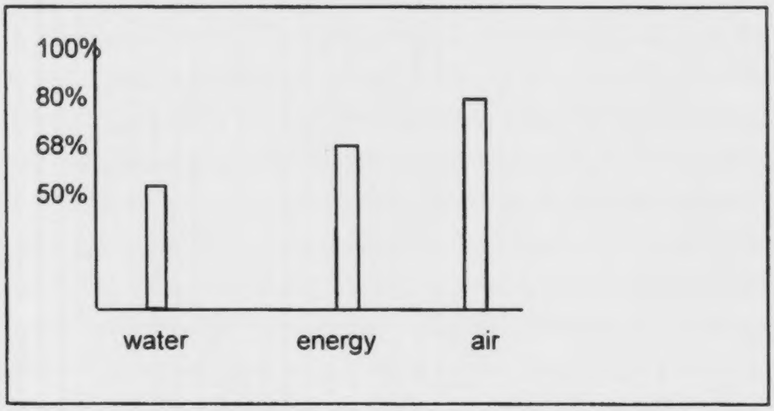
- Visit the local recycling center.
- Have students research and write a report about the art of glass making, including places like Italy, Malta, Czech Republic, Poland, Austria, etc., and where the natural resources to make glass such as limestone, feldspar and soda come from.

Oregon Common Curriculum Goal:
Science: Physical Science: Matter
- Understand structure and properties of matter.

Mathematics: Calculations and Estimations
- Demonstrate conceptual meanings for addition, subtraction, multiplication, and division

Grade 5 Benchmark:
Students will:
- distinguish among solids, liquids, and gases.
- identify unique properties of each state of matter.
- perform calculations on whole numbers, fractions and decimals using paper, pencils and calculators.

Get to Glass Worksheet Answer Key:

1. 1 ton=2251 lbs., 5 tons=11,255 lbs., 62 tons=139,562 lbs., 87 tons=195,837 lbs., 93 tons=209,343 lbs.
2. 

3. Producing 2 tons of virgin glass=48,000 gallons of water/2=24,000 gallons saved by recycling.

4. a) 10 gallons X 43 tons=1720 gallons saved by recycling.

   b) 1.2 tons of raw materialsX69 tons recycled=82.8 tons of materials saved.

   c) 83 tons. 80 tons.

   d) 82.8 tonsX2000 lbs=165,600 lb.

5. a) 400 bottlesX4 hours=1600 hours.

   b) 400 X .75=300 bottlesX 4 hours=1200 hours. 400X .25=100 bottles X 4 hours=400 hours.

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Making and Molding Glass Experiment

The Making of Glass

The following activity simulates the making of glass, substituting sugar for sand. Glass is manufactured by heating sand, lime and soda until the mixture melts. After it cools, it is poured into molds and injected with air. By participating in this activity, students will gain an understanding of the heat and energy required to melt and make the glass mixture, and of the process involved in glass manufacturing and recycling.

Materials:

1 cup sugar
Electric frying pan or hot plate and pan
Sheet of glass
1/4 cup water

Heat the water. When it boils pour in the sugar. Stir this mixture vigorously over heat until the sugar is dissolved, about 5 minutes.

Carefully pour the mixture onto the sheet of glass. (If the glass is small enough, set it inside a cookie sheet to prevent runover). Allow to cool, about 15 minutes. Then hold up the two sheets of glass so students can see through them. By allowing it to set overnight, the "glass" will become frosted.

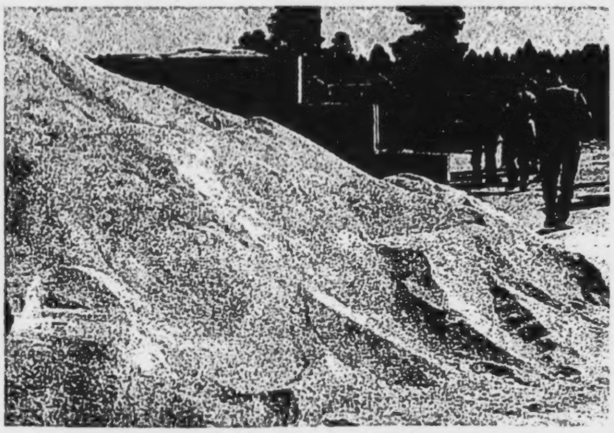
The Molding of Glass

The following activity simulates the molding of glass. All bottles and jars were once made by glass blowers who blew bubbles with the molten glass mixture and formed them into shapes which hardened as they cooled. Injecting air into the molten glass mixture in a mold forms manufactured bottles and jars. By participating in the following activity, students will understand how glass is molded during the recycling process.

Materials:

Stiff straw or glass tubing
Balloon
Wide-mouthed jar
Rubber band to hold the balloon to the straw

Fix the balloon onto the end of the tube or straw with the rubber band. Put the balloon into the jar and ask students to blow up the balloon to fill the jar, which acts as a mold.



Notice how this pile of crushed glass (also known as glass cullet) resembles a pile of sand, the natural resource from which it was created.

Worksheet: Get to Know Glass

Student Name:____

Producing one ton of glass from virgin fiber requires the following resources:	**Recycling one ton of glass yields the follow ing statis-tics:**
1300 lb. of sand	requires 32% less energy
400 lb. of soda ash	requires 50% less water
400 lb. of limestone	creates 20% less air pollution
151 lb. of feldspar	Saves 10 gallons of oil
24,000 gallons of water	Saves 1.2 tons of raw materials
15 million BTU's of energy	
melts at 2800 degrees Fahrenheit	melts at 2500 degrees Fahrenheit

- √ By recycling one bottle you save enough energy to run a 100 watt light bulb for 4 hours.
- √ Recovered 81,670 tons of glass in Oregon in 1999.
- √ Glass containers make up about 3% of all the materials in the landfill in Oregon.
- √ Bottles can be made of up to 50% recycled glass.
- √ Each person in the U.S. uses about 400 bottles and jars a year.

1. How many pounds of sand, soda ash, limestone, and feldspar added together would it take to make 5 tons of glass? 62? 87? 93?

2. Draw a bar graph illustrating how much less energy and water is used and how much less air pollution is created by recycling glass. (Use three bars for water, air, and energy, and put the percentages on the y axis). Hint: Remember that you are comparing this to virgin production which will have a value of 100% on this graph.

3. Knowing that recycling glass saves 50% of the water used in virgin production, how many gallons will be used to recycle 2 tons of glass?

4. a. How many gallons of oil can be saved by recycling 43 tons of glass?

   b. How many tons of raw materials are saved by recycling 69 tons of glass?

   c. Round your answer in part b to the nearest ones place. The nearest tens place.

   d. Knowing that there are 2000 lbs. in one ton, how many pounds of raw materials are saved? (Hint: multiply your answer in tons by 2000 lbs. to do the conversion).

5. a. Knowing that the average person in the U.S. uses 400 bottles in a year and that recycling one bottle will power a 100 watt bulb for 4 hours, how many hours will the bulb run if you recycle all 400 of your bottles?

   b. How long will it run if you only recycle 75% of the bottles? 25%?

6. Write out all of the numbers listed in the glass facts in word form and create at least one math problem of your own using the information given.

7. (Optional) Based on the "Making and Molding Glass experiment" or the video: "Lifecycle of Glass", describe in your own words how glass is made into new glass at the recycling plant.

Lesson: Plastic Polymers

Grade: 4-5
Subject: Science
Objectives:
Students will:

- conduct a series of tests to determine the properties of different types of plastics
- audit the plastic waste generated in their homes
- understand the positive and negative impacts of using plastic, the barriers to recycling some forms of plastic, and the ways in which plastic is remade into new products

Teaching Time: 45 minutes

About a week before you begin this lesson, ask students to bring to class a variety of plastic containers that are empty and clean (#1-#7). Cut pieces approximately two inches square from each plastic sample. (Label one master key set for yourself with a permanent marker).

(Continued...)

Lesson concept borrowed from South Carolina Dept. of Health and Environmental Control and the California Integrated Waste Management Board's curriculums. (see Acknowledgements).

Background:

Plastics are made up of building blocks called hydrocarbons, which are derived from petroleum or natural gas, also called fossil fuels. They are considered nonrenewable resources because the conditions under which they were formed no longer exist. Also, the mining, transportation and refining of petroleum creates a lot of pollution. By reusing plastics again and recycling what we can, we can help slow the virgin production of this natural resource.

There are seven types of plastic, all with different scientific properties. Because of the differences in their properties, they cannot be melted together to form new plastic. It is difficult (with current technologies) to collect and properly sort the different types of plastic from one another which makes recycling opportunities for plastics more limited than some other materials. Today, plastic numbers 1 and 2 are commonly accepted in community recycling programs. In the future, technology and innovation will hopefully lead to greater collection, recycling and remanufacture of plastics into other useable products.

Procedures:

(Optional introductory activity)

Materials needed: a plastic sandwich bag (soft film, not thick ziploc), a pencil, water

- Fill a plastic sandwich bag with water.
- Ask for a student volunteer who is brave to stand under the bag while you push a sharp pencil through it.
- Hold the bag over the volunteer's head. Jokingly tell the class that this event has never before been viewed on national television. Slowly rotate the sharp pencil in through one side of the bag and out the other side. No water should leak out. (Do not push the pencil through completely).
- Ask the students to hypothesize why the bag did not leak when the pencil was pushed through.
- Explain where plastics come from and that the petroleum hydrocarbons are chemically altered from a monomer (one) into a polymer (many) molecular chains. As the pencil is pushed through the bag, it slips between these chains. Unbroken, the chains slide around the shape of the pencil, sealing in the water. A dull pencil, however, breaks the chains and causes the bag to leak. When the pencil is removed, the polymers may move somewhat towards their original shape, but not enough to close the large pencil hole.
- Have the volunteer carefully dispose of the water.

(CORE lesson)

- Assign students to scientific teams of three to four people.
- Provide a set of unlabeled plastic samples from as many types of plastic that you could find and the worksheet "Test Your Plastic Polymers" for each group.
- Ask students to record each sample's plastic properties on the chart.

- Distribute a copy of "Plastics Coding System" to each group. Have students complete their charts by deciding which type of plastic each sample represents.

Materials: worksheet, Test Your Plastic Polymers and Plastics at Home;

handout, Plastics Coding System; Several plastic dish pans or buckets for the float test.

Reflection/Response:

- Encourage students to share their results. Discuss the different properties of the different types of plastics (i.e. stiff, light, flexible).
- **Why are there many different kinds of plastics in use?** Different resins are suited to different uses, depending on their strength, flexibility, and resistance to specific chemicals or heat (some bottles are filled with hot liquids).
- **Why do plastics have to be separated before they can be recycled?** Each plastic has a different set of properties and is used for specific purposes. Various plastics have different melting points, so if they are mixed together, the process becomes contaminated and no longer results in a reusable new plastic.
- Explain to students that the recycling process for plastic containers includes: (1) sorting the containers by their resin types; (2) cutting the plastic into tiny pieces, called pellets; (3) melting the pellets; and (4) reshaping into new plastic objects.
- Students should be advised to never melt plastic themselves because the fumes are very dangerous to your health and to the air quality.

Extensions:

- Find out which plastics are recycled in your area. Plastic containers marked with plastic number codes 1 and 2 are commonly recycled.
- Discuss the negative aspects of using a nonrenewable resource and ways to slow our consumption of these resources.
- Assign the activity "Plastics At Home" as homework. Share reuse possibilities with the class.

Oregon Common Curriculum Goal:

Science: Unifying Concepts and Processes, Physical Science: Matter

- Apply comparison concepts of gradient, scale, symmetry, quantification, and invariance
- Understand structure and properties of matter.

Grade 5 Benchmark:

Students will:

- observe and record change in phenomena for a period of time.
- sort data and display in a logical sequence.
- distinguish among solids, liquids, and gases.
- identify unique properties of each state of matter.

Worksheet: Plastics At Home - *An Investigation*

Student Name:____

Look around your home for things packaged in plastic (# 1-7). Fill in the chart below.

Which plastic code number was the most common (occurred the most frequently)?________________

Which plastic code number(s) were rigid (not bendable)?______________________________

Which plastic code number(s) were clear in color?_________________________________

Which plastic code number(s) were squeezable?_________________________________

Product and size of product in a plastic container	Plastic container code number	Recyclable in your community? YES/NO	Disposal method for this plastic (landfill or recycling center)	How can this plastic be reused?
Example: *gallon of milk*	2	*YES*	*Recycling Center*	*For a storage container; planter; piggy bank.*
1.				
2.				
3.				
4.				
5.				
6.				
7.				

Using your Plastic Coding System handout, list some of the positive environmental qualities of plastic and some of the negative.____

____

Worksheet: Test Your Plastic Polymers

Group Name:____

Number	Semi-Rigid Y/N	Flexible Y/N	Clear Y/N	Opaque Y/N	Floats Y/N	Foam Y/N	Crinkly Y/N	Glossy Y/N

Handout: Plastics Coding System

Abbreviation	Scientific Name	Properties	Examples	Environmental Qualities
PETE 1 PETE	polyethylene Terphtahalate	usually clear or green, sinks in water, rigid, glossy	soda bottles butter jars	recycled into fleece coats, carpet, surfboards
HDPE 2 HDPE	high density Polyethylene	semi-rigid, sinks in water	milk, water jugs juice, bleach bottles	recycled into plastic lumber products like picnic tables
PVC 3 V	polyvinyl chloride	semi-rigid, glossy sinks in water	detergent/cleaner bottles, pipes	the by-products from manufacturing are known to cause cancer; recycled into handrails, house siding
LDPE 4 LDPE	low density polyethylene	flexible, not crinkly	6-pack rings, bread bags, sandwich bags, grocery bags	recycled in small amounts into bags
PP 5 PP	polypropylene	semi-rigid, low Gloss	margarine tubs, screw-on lids, straws, car bumpers	used in the auto industry, difficult to collect for recycling; recycled into car bat tery cases
PS 6 PS	polystyrene	often brittle, glossy	Styrafoam, packing peanuts, egg cartons	no longer made with CFCs, but the by-products from manufacturing degrade air quality; recycled into pencil holders, tape dispensers
7 Other	multi-layer Plastics	squeezable	ketchup and syrup bottles	layered aspects make this difficult to recycle; recycled into benches, marine pilings

Lesson: Now You See It, Now You Don't

Grade: 4-5
Subject: Science, Math, English (extension)
Objectives:
Students will:

- classify organic and inorganic objects
- perform a mini-compost experiment
- record observations
- compare and contrast decomposition rates for organic and inorganic materials

Teaching Time: two 45 minute periods (weeks 1 and 5); four 10 minute weekly observations (weeks 2-5)

Materials: Large clear plastic or glass jars (one jar for each group of 4 students); Collect from home or school: samples of organic materials (pieces of paper, egg shells, potato and fruit peels, apple cores, bread, leaves, grass clippings; samples of inorganic materials (rock, bottle caps, glass, small plastic comb, aluminum foil); garden soil (not potting soil); labels to identify jars;

(Continued...)

REDUCE
REUSE
RECYCLE

Background:

When we mention recycling, we often think of recycling glass bottles, aluminum cans and newspapers. But almost another 30% of the household garbage we throw out also can be recycled. These recyclables are food scraps, leaves, grass clippings and other biodegradable organic wastes. Organic wastes can be recycled through a process called composting. Simply stated, composting creates optimal conditions for decomposition to occur. Decomposition is the biochemical process by which bacteria, fungi and other microscopic organisms break organic "wastes" into nutrients that can be used by plants and animals. Decomposition occurs in nature whenever a leaf falls to the ground or an animal dies. This is the end of nature's cycle and it is essential for the continuation of life on earth. The result of decomposition in a compost pile is a nutrient-rich humus that is excellent for improving soil quality and plant growth.

**Do not use potting soil for this experiment because it does not contain any microbes that will aid the decomposition process.*

Procedures:

- **I would like you to name some kind of item and watch as I write it in a certain category. See if you can figure out the categories I am using.** As each item is named, place it in the group of organic (living or once living) or inorganic (not living or once living) things.
- After this short activity, make sure students understand the difference between organic and inorganic. By knowing this difference in objects, we can do something that is very good for the earth.
- Distribute "Now You See It, Now You Don't" worksheets to each team of three to four students. Discuss with students and lead them to recognize that organic materials are more likely to decompose easily, whereas inorganic material tend to take a very long time to break down, if ever.
- Give each team a jar, samples of organic and inorganic materials, soil, water and label. Have teams label their jars with their names. **Now, put several inches of soil into the jar, followed by the organic and inorganic materials. Cover the soil and add enough water to moisten the soil without making it soggy. Don't cover your jar, but place it by a window or somewhere that it will receive sunlight. You will have to moisten the soil regularly to keep it damp, but NOT soggy.**

(Weeks 2-5)

- Choose one day of each succeeding week to record observations. Students will need to spread contents onto newspaper for viewing. Students use observation sheet, "Now You See It, Now You Don't" to record what they find.

Reflection/Response:

- On the last day of the experiment, have each group present its findings to the class. Encourage students to compare their observations for similar and different findings.
- Discuss with students why they think some materials decomposed rather quickly, while others didn't decompose at all.
- Have students write a description of their experiment including a summary of their findings.
- Ask students if they believe things placed in a landfill will decompose or compost. (NO!) Why not? Because you need air, water and light to help decomposition, all things which are limited because of landfill construction. In fact, landfills have so little air, it causes anaerobic conditions (without oxygen at all)! When you place food or other organic materials under anaerobic conditions, you get a by-product called methane gas which is foul smelling and bad for the environment in large quantities. These are all good reasons why we should compost in our backyards and schools whenever possible.
- Share with the class the information on the transparency "When Will These Things Decompose?" NOTE: Some items, such as plastic derived from petroleum (an organic origin), are classified as inorganic because: (1) technology synthetically changes the composition during the manufacturing process, and (2) the length of time needed for plastic to decompose is unknown.

Extensions:

- Perform the Extension: "The Benefits of Composting". You will investigate the following: plant flowers in compost only; plant identical flowers in potting soil only; plant identical flowers in a 2/3 potting soil, 1/3 compost mixture and chart the three growth patterns; have students form conclusions about which mixture is the healthiest for plants. (A 2/3 to 1/3 ration is considered ideal for supplementing soil with compost. If the experiment yields no noticeable difference among the groups, discuss with students how scientists use many replicates of samples to control for errors).
- Read Gary Larson's *There's a HAIR in my dirt! : A worm's story.* Harper Collins, 1998.

Oregon Common Curriculum Goal:

Mathematics: Statistics and Probability

- Collect, organize, display, interpret, and analyze facts, figures, and other data.

Science: Unifying Concepts and Processes

- Apply foundation concepts of change, cycle, cause and effect, energy and matter, evolution, perception, and fundamental entities.

Grade 5 Benchmarks:

- Collect, organize, display, and analyze data, using number lines, bar graphs, line graphs, circle graphs, stem and leaf plots and histograms.
- Observe and record a change over time, sort data and display in a logical sequence, explain the experiment in terms of cause and effect.

worksheet and observation sheet (one per student) Now You See It , Now You Don't; newspaper; transparency, When Will These Things Decompose?

(Optional extension:) worksheet, The Benefits of Composting Experiment and a small amount of compost, potting soil, three pots, and identical seeds.

Video: "Worm Bin Creatures Alive Through a Microscope", see Resource section for availability

Vocabulary:
organic
inorganic
composting
decomposition

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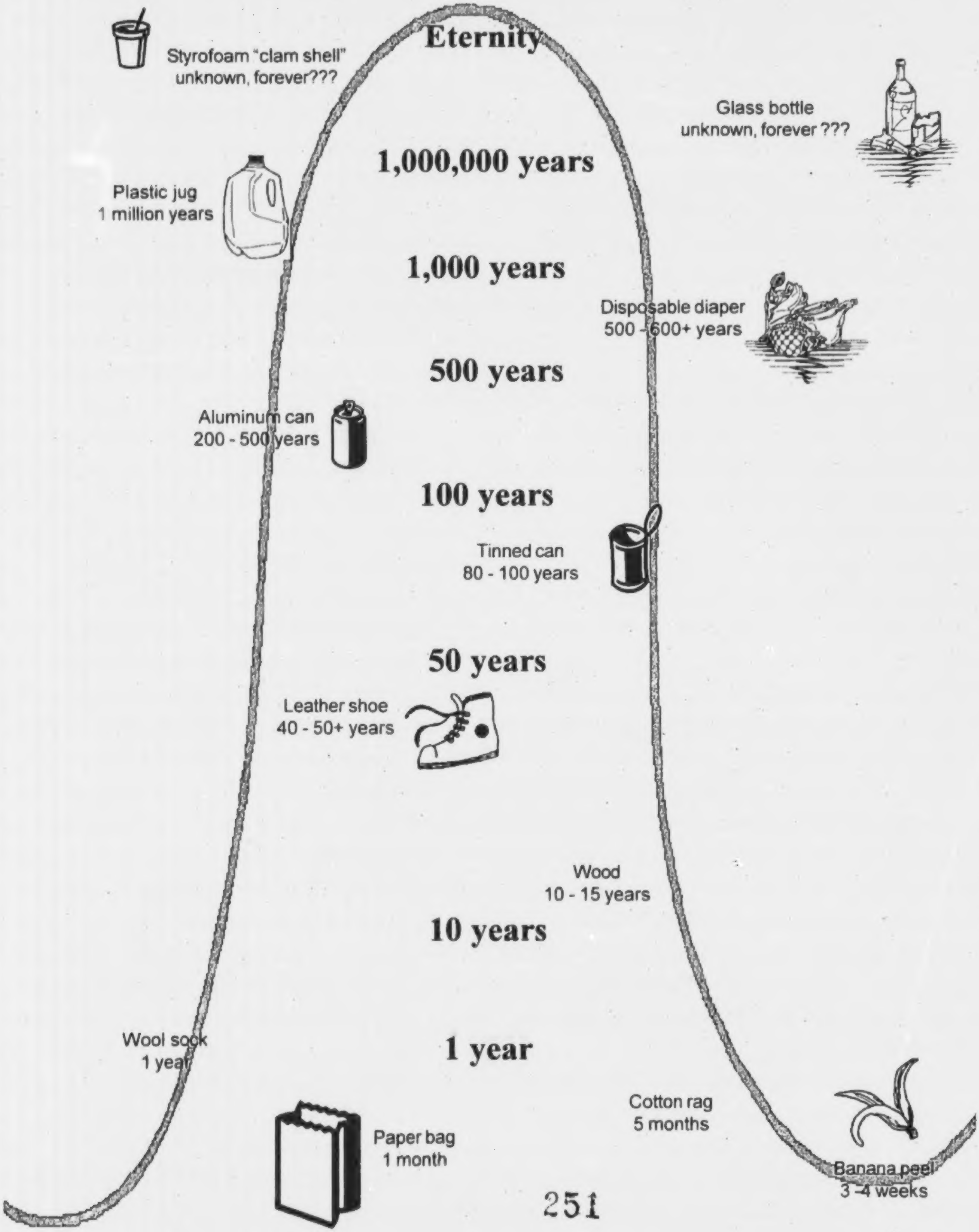
Overhead: When Will These Things Decompose?



Eternity

Styrofoam "clam shell"
unknown, forever???

Glass bottle
unknown, forever ???

1,000,000 years

Plastic jug
1 million years

1,000 years

Disposable diaper
500 - 600+ years

500 years

Aluminum can
200 - 500 years

100 years

Tinned can
80 - 100 years

50 years

Leather shoe
40 - 50+ years

Wood
10 - 15 years

10 years

Wool sock
1 year

1 year

Cotton rag
5 months

Paper bag
1 month

Banana peel
3 -4 weeks

Worksheet: Now You See It, Now You Don't

Group Name:

List the items that you are placing into your jar.

Hypothesize which items will break down over the five week period (from fastest to slowest).

Week One: Observations
Which items do you notice any changes in? Describe and record findings here.

Week Two: Observations
Which items do you notice any changes in? Describe and record findings here.

Week Three: Observations
Which items do you notice any changes in? Describe and record findings here.

Week Four: Observations
Which items do you notice any changes in? Describe and record findings here.

Week Five: Observations
Which items do you notice any changes in? Describe and record findings here.

Summarize the results of your experiment. Which items did you correctly or incorrectly predict would break down? Summarize the key lessons that you learned from this experiment about waste, natural cycles and decomposition.

Extension: The Benefits of Composting Scientific Experiment

The purpose of this experiment is to try to demonstrate the beneficial use of compost in the garden. Scientists have tested compost and found that it contains many nutrients that plants need, helps the soil hold in water that plants need, and can be used instead of fertilizers which, when used improperly, can be harmful to the environment. Composting also means that we don't have to send our leaves, grass, and food waste to the landfill which is also good for the environment! This experiment will use three types of potting mixtures to see which one has the best effect on growing a plant.

Step 1: Write a your hypothesis about which pot will grow the most healthy plant:

____

____

Step 2: Plant all of the pots.
Pot 1 will contain potting soil only.
Pot 2 will contain compost only.
Pot 3 will contain 2/3 potting soil to 1/3 compost, evenly mixed together before placing it into the pot.

Follow the instructions for the type of seed you are planting and be sure that each seed in all three pots is planted at the proper depth (and that all three seeds are planted at the same depth).

Step 3: Water each pot with enough water to entirely run through the pot and out of the bottom. Give each pot the same amount of water (about 1/2 cup). Continue water each pot on the same day, at the same time, with the same amount of water for the duration of the experiment. Water every time the soil begins to feel dry just under the surface.

Step 4: Using a calendar, mark the first day that each seed breaks the surface of the soil.

Step 5: Measure the height, number of leaves, and flowers (if it is a blooming plant), every fifth day after the plant breaks the surface of the soil. (If the fifth day is going to fall on a weekend, the class may want to try measuring every fourth or third day instead).

Step 6: Once you have reached the end of the designated growing time--as determined by your teacher, answer the following questions:

1. Was your hypothesis correct?______________________________________

2. Which potting method was the best for the plant?____________________________

3. If you could not determine which method worked best from this experiment, discuss with your teacher some possible reasons for this and write them here.____________________________

____

____

____

4. List the ways in which composting helps the environment. (There are at least four, can you think of more?)____

____

____

____

HELP OUT A HOMELESS WORM
SKID ROW
MAKE A COMPOST PILE

Artwork by Evan Green, Grade 12, Sam Barlow High, Gresham-Barlow SD 10J, submitted for the Metro Regional Services Earth Day Bill Board Contest, 2001.

Lesson: Natural Gardening

Grade: 4-5
Subject: Science, Health, Art (extension)
Students will:

- understand the connection between the use of certain lawn care products and "non-point source" pollution
- learn about natural gardening as an alternative to using fertilizers and pesticides

Teaching Time: 50 minutes

Materials: worksheet, Bugs 101, handout, Common Garden Pest Insects; Beneficial Garden Insects and Plants that Bring Beneficials

(Optional:) Video: "Worm Bin Creatures Alive Through a Microscope", see Resource section for availability

Vocabulary:
non-point source
point source
pest
beneficial

Lesson concept: *Planning for a Liveable Future* 6-12 curriculum (2000) authored by Shelly Washburn for Metro Regional Services.

Background:

Hazardous waste disposal in Oregon is very costly (about $1.4 million or more every year). Yard and gardening products such as pesticides and fertilizers comprised 24% of all the hazardous products collected from people's homes in 1999. These products are often improperly applied which can be dangerous to children, pets and wildlife when they come into contact with these chemicals in the yard. Additionally, the use of yard and gardening products contributes to what is known as "non-point source" pollution. This means that rain and irrigation practices carry the chemicals out of our yards and down into the soil, sometimes into ground wells or other drinking water sources, and into rivers and streams where it damages fish, birds and other wildlife that feed in these watershed areas.

The U.S. Environmental Protection Agency (EPA) estimates nearly 70 million pounds of active pesticide ingredients are applied to urban lawns each year. This figure relates to the 20-30 million acres of lawns that are sprayed in America, resulting in an annual input of between five and seven pounds per acre each year. The Oregon Department of Environmental Quality monitors the health of our rivers and streams, many of which have already been compromised from too much pollution. Thus, it is important to reduce our use of yard and gardening products by using natural gardening practices whenever possible.

Procedures:

- Ask students to name all of the insects they have seen or heard of that live in the area. Write them on the board.
- Now ask students to classify their list of insects as either helpful to humans or harmful. (Some insects will be neither and it is useful to remember that insects play an essential role in the environment whether or not we like them.) Have students explain why they think certain insects are harmful. What does it do?
- Ask students to define what a pesticide, insecticide and herbicide is. Tell them that a pesticide – by definition – is a substance harmful to some living thing. (The morpheme "cide" means to kill.) **Insecticides are harmful to insects. Herbicides are harmful to plants. People use these products to kill insects and weeds that are harming their garden or home. While pesticides are sometimes necessary, overuse of them at home can cause water quality problems miles away. Water from rain or irrigation carries pesticides into street drains and eventually into waterways. This is called "non-point source" pollution.** Write the term on the board and present other information described in the Background. **Pollution that comes directly from one source like a factory pipe that drains into the river is called "point source" pollution. It is regulated to limit the amounts and types of chemicals that get into the water, but non-point source pollution is very difficult to control. That's how we can all be a part of the solution to clean up rivers and streams by keeping hazardous products from being released from our homes!**

- Ask students what kinds of problems pesticides might cause. (Students' answers could include pollution that: kills fish, aquatic life, and plants; affects human drinking water; kills or sickens birds and other animals that eat aquatic life, including humans who eat fish from polluted waterways, and can accidentally harm children or pets who come in contact with these chemicals while in our yards.)
- Pass out the handouts and have students individually or in teams answer the questions on the worksheet.

Reflection/Response:

- **What did you learn today about insects and their connection to using less pesticides in our yards or gardens? Does it surprise you to learn that some insects are very useful and that they are "not all bad"?**
- **What are the ways in which having pesticides at our homes is dangerous to ourselves or to the environment?** (Help students make the connection that "left over" chemicals must be properly disposed of as hazardous waste and that chemicals sitting around our homes might be spilled, can create fire hazards, and are dangerous if contacted by children and pets when they have been used in the yard or are left sitting around on shelves. **Lawn care products from homes are the largest contributors to non-point source pollution that contaminates our lakes, rivers and streams**.)

Extensions:

- Have students look up pictures of the beneficial plants and illustrate a garden with some of the plants and insects in the lesson.
- Visit a community garden or invite a landscape specialist to speak about natural gardening and native northwest plants.

Answers to Bugs 101 Worksheet:

1. Answers will vary depending on the class background discussion.
2. Cutworm
3. Leaf roller
4. Flower fly
5. Lady bug, lacewing or parasitic wasp
6. Dill, fennel, golden margarite, or purple poppy mallow
7. Yellow
8. Fennel
9. List varies according to student

Oregon Common Curriculum Goal:

Health Education: Safe and Healthy Environment and Controllable Health Risks and Informed Consumer

- Understand the potential influences of environmental factors on personal and public health.
- Understand and apply prevention and risk reduction strategies for health-related interventions.
- Understand and apply strategies to improve and maintain individual, family, school and community health.
- Evaluate the validity and reliability of heath-related information, products and services as a consumer or potential consumer.

Science: Life Science: Diversity/Interdependence

- Understand the relationships among living things and between living things and their environments.

Grade 5 Benchmarks:

- Describe the relationship between characteristics of specific habitats and the organisms that live there.

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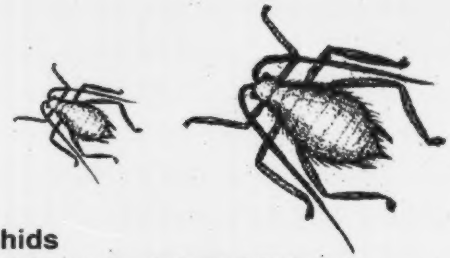
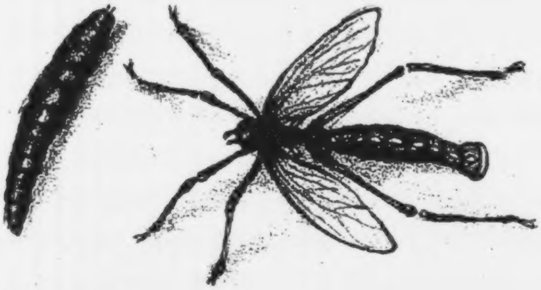
Handout: Common Garden Pest Insects

Illustrations by Antonia Manda



Aphids

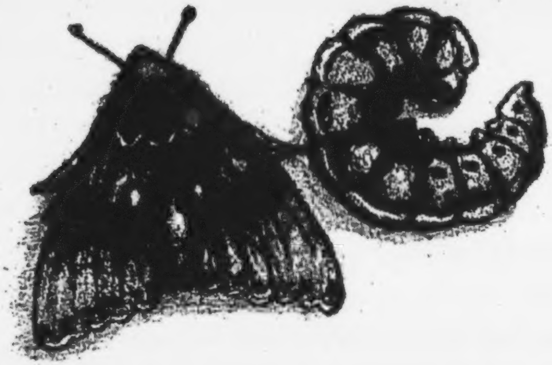
Aphids are tiny (about 1/8" long), oval insects that come in an array of colors: green, black, brown, purple, pink, red, and yellow. Some have wings and others do not. They drive gardeners wild when they suck the sap from plants causing them to wilt and curl. Aphids also carry plant diseases. It's hard to keep aphids under control because they reproduce so rapidly. Aphids bear live young and these babies are frequently pregnant when they are born.



Crane fly

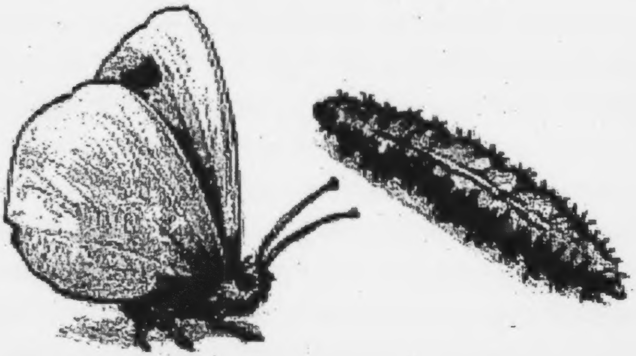
The European crane fly is a fairly recent arrival in Oregon and looks a lot like the variety commonly found here. Adult crane flies look like giant mosquitoes and are sometimes called mosquito hawks. The common variety is harmless and is found around marsh areas.

Crane fly larvae or grubs are the ones that can cause problems. These are tan, worm-like insects up to 1 1/2" long that live in the top layers of soil and destroy the roots of grass and other plants.



Cutworms

Cutworms are grayish-brown caterpillars that curl up when you touch them. They hide in the soil by day and crawl out at night and nip the stems of seedlings. A visit by a cutworm looks like someone with a pair of scissors attacked your garden.

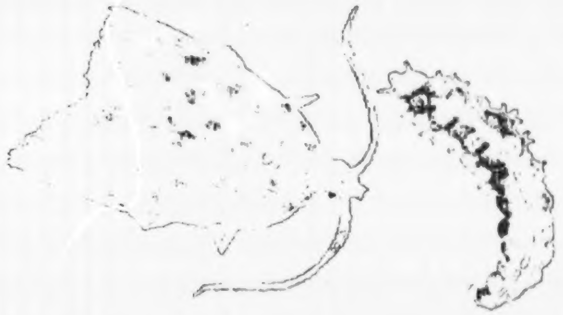


Imported cabbageworm

The adult cabbageworm is a white butterfly with black tips and spots on each wing. They flutter about the garden all summer and can be beautiful to watch. But their green larva eat ragged holes in the leaves of plants in the cabbage family and soil the leaves with dark excrement.

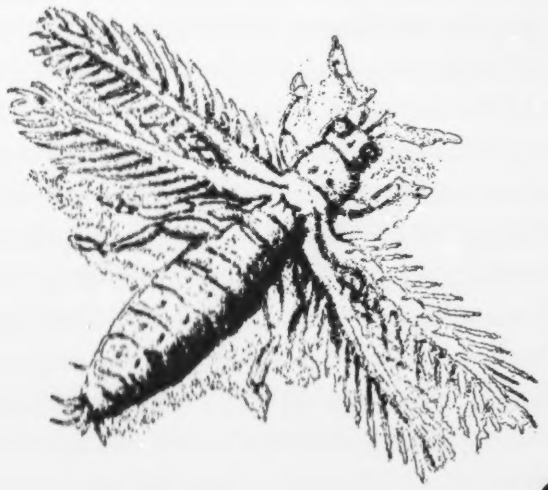
Source: Metro Regional Services: *Planning for a Liveable Future* 6-12 curriculum (2000).

Illustrations by Antonia Manda



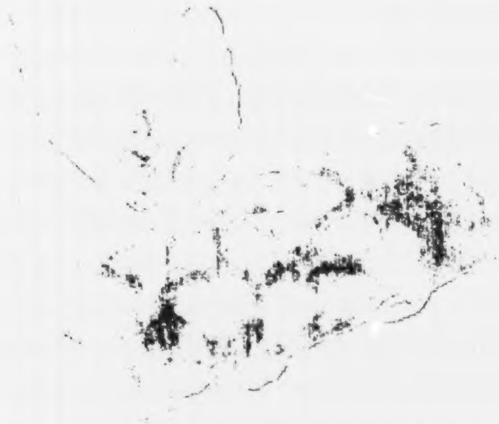
Leaf rollers

The larval stage of the leaf roller is a caterpillar that folds a leaf around it, webs it, and then feeds inside. Different kinds of leaf rollers attack different plants, including apple, willow, and plum trees, blueberries, photinia, and laurel.



Thrips

These are tiny, elongated, fast-moving insects about 1/5" long or less. Adults and nymphs suck sap from plant tissue, leaving silvery spots or streaks on the leaves. Thrips can produce young without mating. This process, like that of aphids, allows thrips to rapidly produce huge populations.



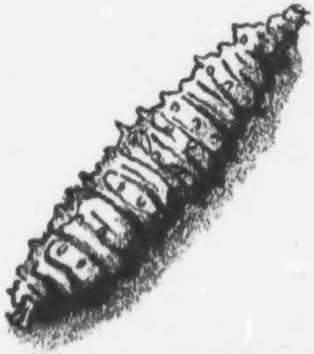
Scale

There are many varieties of scale which suck plant sap, weakening the plants and causing leaves to yellow and drop. They have two to four larval stages. The first looks like a mite, and subsequent stages look like smaller versions of the adult females which resemble bumps on stems, leaves, and fruit.

Handout: Beneficial Garden Insects

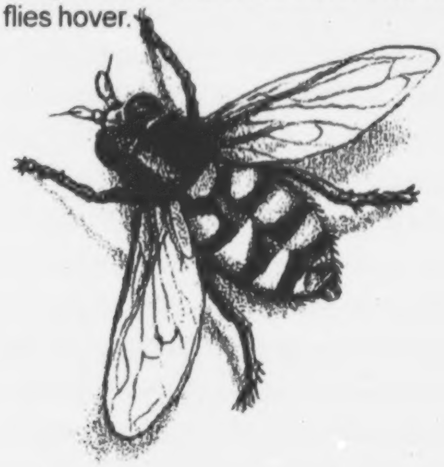
Illustrations by Antonia Manda

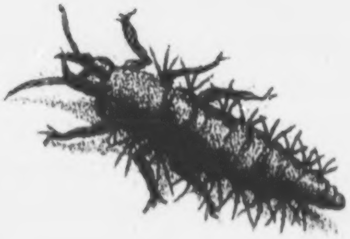
Listed here are only a few of the beneficial insects that help control harmful insects. In addition to insects there are many other animals that feed on pest insects, such as birds, frogs, snakes, ducks, and bats.



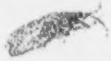
Flower flies
Sometimes called hover or syrphid flies, these predators look something like a small yellow jacket wasp, but they will not sting humans or other mammals. They are often found hovering near flowers where they feed on pollen and nectar. Their larvae are legless and feed on aphids and scales.

To attract flower or hover flies, grow pollen-making plants like sweet alyssum and wild mustard. Place fences or grow tall sunflowers in the garden to break the wind. This helps flower flies hover.

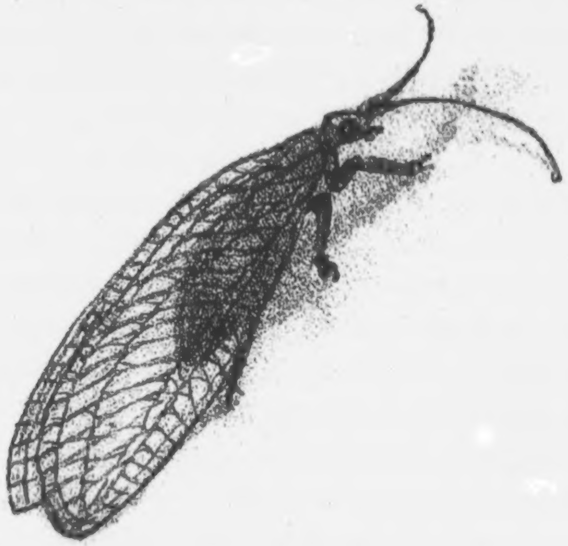




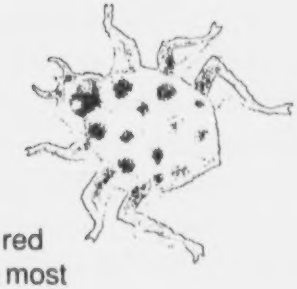
Lacewings
The most common lacewings are bright green insects with large golden eyes and delicate wings. They are about 3/4" long and eat pollen, honeydew and nectar. The tan larvae look something like tiny alligators and eat aphids and other soft-bodied insects. A similar-looking insect is the brown lacewing. It is also an effective aphid predator.



To attract lacewings, plant flowers such as dill, caraway, sunflowers, cosmos, and goldenrod. Provide water in a small pan filled with gravel, especially during hot, dry weather.

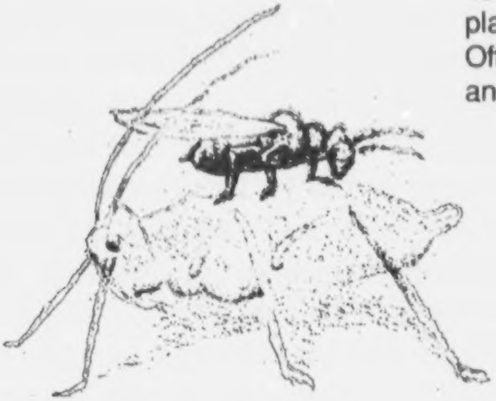


Source: Metro Regional Services: *Planning for a Liveable Future* 6-12 (2000).



Ladybird beetle
Better known as ladybugs, these black and red beetles are found throughout the world. The most common species in Oregon eat aphids and other small, soft-bodied insects. The larva of this beetle are usually black, 1/8" to 1/2" long and somewhat spiny. They look like tiny alligators and feed on aphids.

To attract ladybugs, plant dill, goldenrod, yarrow, sunflowers, and corn for pollen. Ladybugs like weedy areas in the yard where they can overwinter. Plant native grasses for these areas.

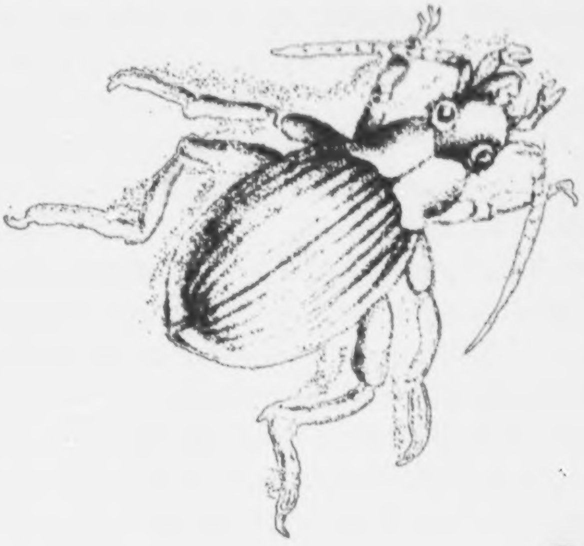


Parasitic wasps
Most insects and many insect eggs are host to one or more species of parasitic wasps. Often tiny and delicate, parasitic wasps sting their host insect and lay eggs inside them. The eggs hatch inside the host and feed on it, eventually killing it. In our region, aphids are commonly parasitized by these wasps as well as some caterpillars. Parasitic wasps are extremely effective at controlling insects but are susceptible to most sprays. Parasitic wasps do not sting humans.

To attract parasitic wasps, plant mints and herbs. Grow tall plants for shelter.

Predaceous ground beetles
These large, glossy, dark brown or black beetles with grooves down its back will eat many insects. It likes to hide in compost or under plant cover.

To attract ground beetles, grow pollen making plants such as goldenrod and wild amaranth. Offer moist shelter and dense cover with perennials and stone walkways.



Handout: Plants That Bring Beneficials

PLANT	DESCRIPTION	BENEFICIAL INSECT
Dill (Anethum graveolens)	3' tall, yellow flowers, fern-like foliage, annual herb	Lacewings Ladybugs Hover flies Parasitic wasps
Fennel (Foeniculum vulgare)	5' stalks, ferny bronze or green foliage, yellow flowers, perennial herb	Lacewings Ladybugs Hover flies Parasitic wasps
English lavender (Lavendula augustifolia)	1 – 4' tall mounds of gray foliage, spikey lavender flowers, perennial	Hover flies
Fern-leaf yarrow (Achillea filipendulina)	3 – 4' tall, flat yellow flower clusters, perennial	Hover flies Parasitic wasps
Golden margarite (Anthemis tinctoria)	Small yellow daisies, perennial	Lacewings Ladybugs Hover flies Parasitic wasps
Purple poppy mallow (Callirhoe inyolucrata)	Trailing plant with cup-shaped flowers, perennial	Lacewings Hover flies Parasitic wasps

BUGS
Chemicals

Artwork by Jamie Speirs, Grade 8, Hosford Middle School, Portland SD 1J. Submitted for Metro Regional Services Earth Day Bill Board Contest, 2001.

Source: Metro Regional Services: *Planning for a Liveable Future* 6-12 (2000).

Worksheet: Bugs 101- Student Pages

What is an insect?

Insects have inhabited the earth for over 200 million years and are found everywhere on the planet – even at the poles. While insects are not always popular, they are necessary. Insects provide food for other animals; they pollinate plants, produce honey, and spin silk. They eat carrion and break down plant refuse. They offer beauty and interest to our lives.

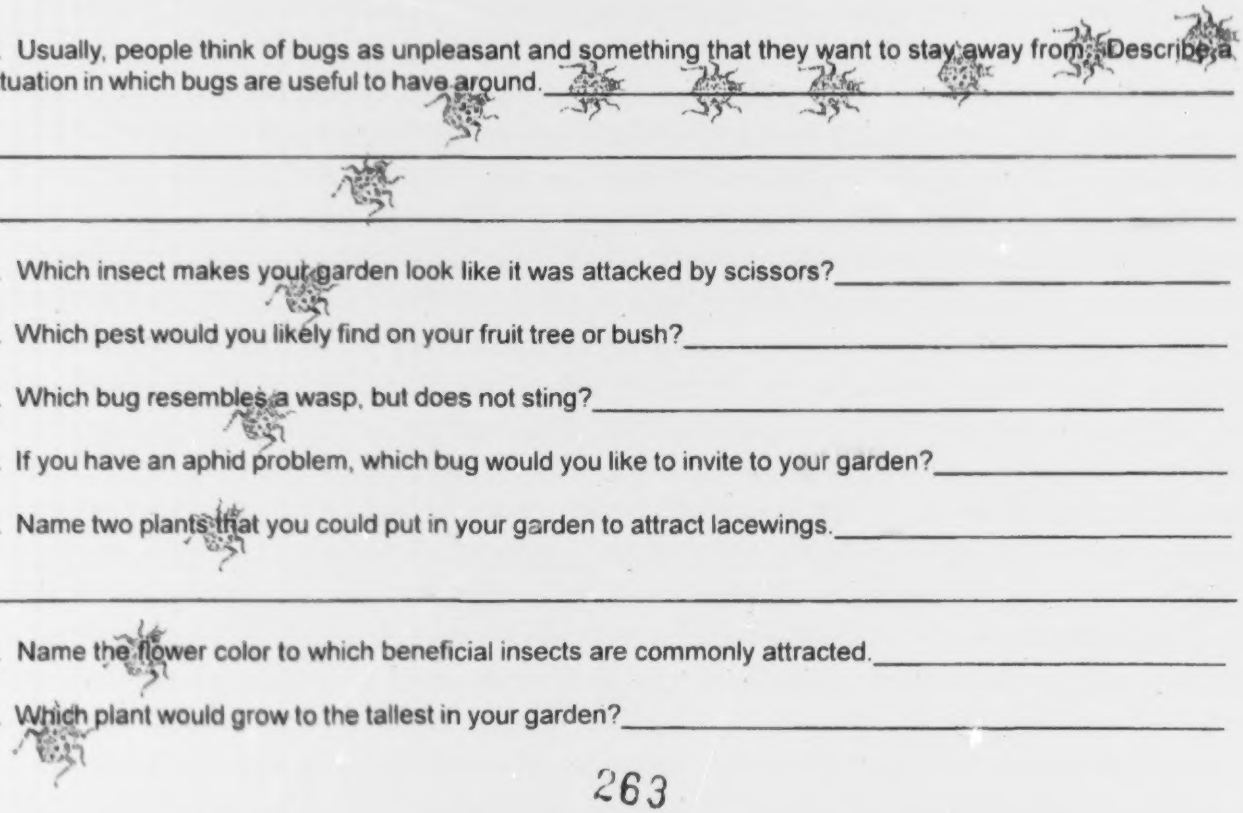
Insects are relatives of the crab and lobster. Like them, they have a hard outer skeleton or shell. The body of an insect is divided into three sections: the head, thorax, and abdomen. Insects normally have three pairs of legs attached to the thorax.

KINDS OF INSECTS

The Class of Insecta is the largest group of animals in the world. The class is divided into 26 orders which describe over a million species. The order of Coleoptera (beetles) alone contains approximately 300,000 listed species. Some authorities believe that we have discovered less than five percent of the insects that live on the earth.

For our purposes here, we will lump many different kinds of insects into these two categories: pest and beneficial. We will call an insect a pest when it becomes destructive in the garden. We'll call an insect beneficial when it pollinates plants or causes no harm. Especially prized by gardeners are those beneficial insects that eat or otherwise destroy pest insects. These are predators.

A very general rule for identifying a predator is this: if the jaws of the insect point OUT, parallel to the surface it is walking on, it is a predator. If the jaws of the insect are pointing DOWN toward the surface it is walking on, the insect is a plant eater.



1. Usually, people think of bugs as unpleasant and something that they want to stay away from. Describe a situation in which bugs are useful to have around. ____________________

____

____

2. Which insect makes your garden look like it was attacked by scissors? ____________________

3. Which pest would you likely find on your fruit tree or bush? ____________________

4. Which bug resembles a wasp, but does not sting? ____________________

5. If you have an aphid problem, which bug would you like to invite to your garden? ____________________

6. Name two plants that you could put in your garden to attract lacewings. ____________________

____

7. Name the flower color to which beneficial insects are commonly attracted. ____________________

8. Which plant would grow to the tallest in your garden? ____________________

9. Make a list of all the bad things that can result when certain lawn care products get into the environment.

Lesson: Hazardous Routes

Grade: 4-5
Subject: Health, English
Students will:

- identify ways people dispose of household hazardous waste
- identify the impacts these disposal methods have on health and the environment
- suggest safe alternative management routes for household hazardous wastes
- learn vocabulary: poisonous, toxic, hazardous, dangerous, flammable, ignitable, corrosive, reactive, irritant
- understand that the words: "caution," "warning," and "danger" have special meaning and that children should never play with certain types of household products

(Continued)

Background:

Many products commonly used for cleaning, gardening and auto maintenance, if used or disposed improperly, are hazardous. (See "There is No Away" Background for information on hazardous material disposal). These products are referred to by solid waste professionals as "Household Hazardous Waste" or HHW. In total, the state of Oregon spends around 1.4 million dollars per year for HHW disposal and education.

You can recognize hazardous products because they have special signal words on the labels that say, "Caution", "Warning", "Dangerous" or "Poisonous". Many of these products, when used by a business, have regulations on how they may be disposed. However, in our homes, there is little control over how these products are handled. Thus, education and awareness of these hazards, combined with knowledge of less toxic substitutes, will help preserve and protect Oregon's environment.

Hazardous products can enter the environment in a variety of ways. Sometimes when a person has no more use for the product but there is still some left in the container, the products are dumped in toilets or drains (i.e. sinks and tubs). These drains go directly into sewers or septic tanks. The sewer systems usually lead to wastewater treatment plants, but sometimes flow into rivers as well. Wastewater treatment plants are not designed to handle most hazardous wastes. Also, large amounts of hazardous wastes may kill the living organisms used to break down chemicals in treatment and septic plants. If these organisms are killed, the system does not work properly, and hazardous wastes can enter our waterways.

Other methods of disposal may include dumping on the ground, sending the material to the landfill or incinerator, or burning garbage at home. When applied to the ground, these hazardous chemicals leach through the soil or out of leaking landfills, eventually contaminating our groundwater. Incinerating hazardous wastes can release harmful air pollutants and products in aerosol cans may cause explosions. People burning their own garbage at home can create serious hazards to themselves and the air quality by burning hazardous products and plastic containers.

Another way these chemicals enter the environment is through "surface run-off" during rain storms. For example, if gardening products are improperly or over applied, water running off your property during a rain storm may enter nearby streams, rivers, or sewer systems and cause surface water pollution. In the environmental field this is known as "non-point source pollution". In fact, non-point source pollution is a greater contributor to our environmental problems because it is difficult to regulate. The best method of pollution prevention is to minimize the use of hazardous products and use good judgement when you use them.

Procedures:

- Today we are going to learn about ordinary things inside or around our house that may be harmful (or hazardous) to us, to wildlife, or to the environment.
- **Can anyone name some things you have seen at your house that you believe could be dangerous?** (Some examples are: a type of cleaning product in the kitchen, laundry room, or bathroom or some other products used in your yard or on your car). Write the student's responses on the board.
- Pass out the worksheet *Words of Warning* and instruct students not to turn over *Words of Warning*. First, fill in their own definitions of the words. Tell them that if they don't know to leave it blank, and that by the end of the lesson, these words should be familiar to them.
- **Who knows what it means if something is poisonous, toxic, or hazardous? Something that is poisonous, toxic, or hazardous can cause illness, injury or death.** Students should know that these words mean that something can be harmful to people and to the environment and that great care should be taken to avoid these dangerous substances and to prevent their release into the air, water or soil.
- **Tell me and show me the five different routes a hazardous substance might enter the body.** (Eyes, nose, mouth, ears, skin). Display the transparency "Routes of Exposure".
- Introduce the two puppets and tell the children that they have a story to share.
- Perform the play for the class.

Reflection/Response:

- Display and discuss the transparency "Learning about Labels" or show actual examples of hazardous labels on products to the class.
- Display and discuss the transparency "Hazardous Products" and "Dangers". Help students understand that chemicals are dangerous to humans, animals and the environment.
- Now display the transparency "Hazardous Routes". Help students realize how products get released either intentionally or accidentally into the environment through storm drains, waste water treatment plants, landfills, incinerators, and non-point sources as described in the Background section. Students should realize that these chemicals escaping into the environment can end in our bodies through drinking contaminated water or by eating fish from contaminated rivers, so we must use as much care as we can to properly use and dispose of these products.
- **What warning words have you learned today?**
- **Should you ever play with household products or try to use them without your parents permission?** NO!

Teaching Time: Introduction 10 minutes. Read the play and go over the overheads 50 minutes. Student time to fill out Words of Warning 20 minutes.

Materials: Two puppets (any type); Play: "Rocky's Not-so-Fun Adventures" (in the Resource section); worksheet, From Sink to Stream (maze); transparency, Hazardous Waste Routes; Learning about Labels; Routes of Exposure; Hazardous Products; and Dangers; worksheet, Words of Warning and Identify the Hazards

(Optional:) Bring in examples of products with hazardous labels.

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- **How do we get rid of hazardous products? First we use it properly until it is gone; next, if you have some leftover materials, give it to someone else who can use the rest; third, store it properly until it can be taken to a household hazardous waste collection center or to a collection event for hazardous products.**
- **How will you keep yourself and others from getting harmed by these things?**
- Now turn your worksheet over and read the correct definitions for all of the important warning words you have learned today and fill in the definitions in your own words.
- Assign Sink to Stream maze and the Tips for a Safer Home handout and ask students to talk with their parents about what they have learned.

Extensions:

- Visit a waste water treatment plant or invite someone to come speak to your class.
- Call your local city or county solid waste official to find out more about safe disposal in your area. Also call the Household Hazardous Waste Hotline: 800-732-9253.
- Visit the Oregon Department of Environmental Quality's web site at: http://www.deq.state.or.us/wmc/solwaste/hhw.html and have students report on their findings.

Oregon Common Curriculum Goal:

Health Education: Safe and Healthy Environment

- Understand the potential influences of environmental factors on personal and public health.
- Understand and apply prevention and risk reduction strategies for health-related interventions.
- Understand and apply strategies to improve and maintain individual, family, school and community health.
- Evaluate the validity and reliability of heath-related information, products and services as a consumer or potential consumer.

English: Literature

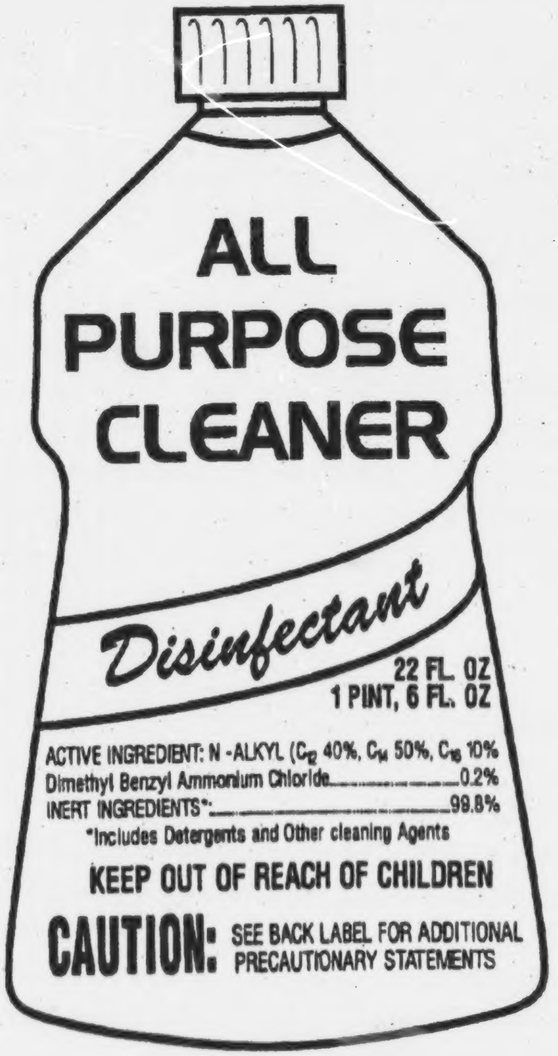
- Evaluate how use of literary elements and devices (e.g., setting, plot, theme, character, word choice, point of view, tone, language) contribute to the work's message and impact.

Grade 5 Benchmarks:

Students will:

- identify how literary elements contribute to the overall meaning of a selection.
- identify a theme of a selection.
- identify how dialogue is used to develop characters and mood in a selection.

Overhead: Learning about Labels


ALL PURPOSE CLEANER
Disinfectant
22 FL. OZ
1 PINT, 6 FL. OZ
ACTIVE INGREDIENT: N -ALKYL (C_{12} 40%, C_{14} 50%, C_{16} 10%
Dimethyl Benzyl Ammonium Chloride……0.2%
INERT INGREDIENTS*:……99.8%
*Includes Detergents and Other cleaning Agents
KEEP OUT OF REACH OF CHILDREN
CAUTION: SEE BACK LABEL FOR ADDITIONAL PRECAUTIONARY STATEMENTS

WORDS ON LABELS THAT MEAN HAZARDOUS

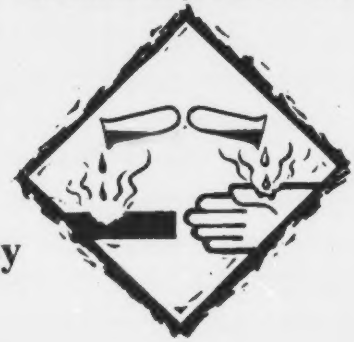
Caution
Corrosive
Danger
Explosive
Flammable
Keep away from children and pets
Harmful if swallowed
Ignitable
Warning
Poison
Toxic

Source: California Integrated Waste Management Board: *Closing the Loop: Exploring Integrated Waste Management and Resource Conservation K-6* (2000).

A Product Is Hazardous When It Is:

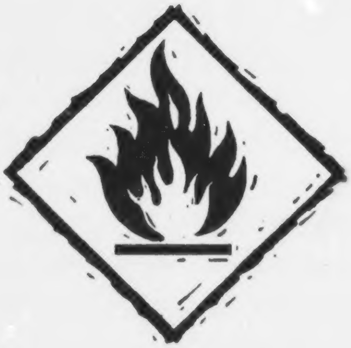
CORROSIVE /CAUSTIC

Can burn and destroy living tissues when brought into contact



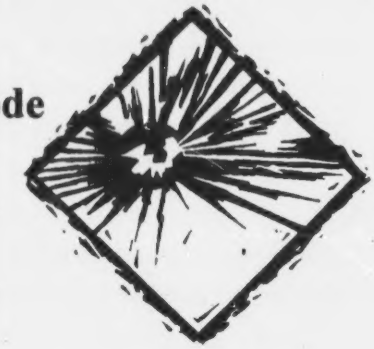
FLAMMABLE

Can easily be set on fire or ignited



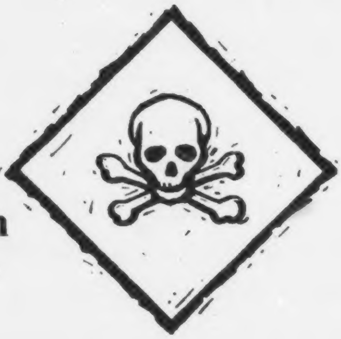
REACTIVE

Can detonate or explode through exposure to heat, sudden shock or pressure



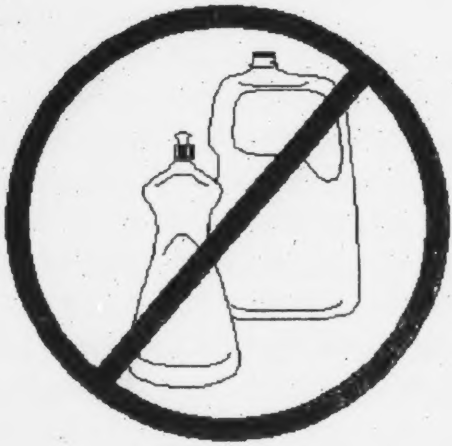
TOXIC

Capable of causing injury or death through ingestion, inhalation or absorption



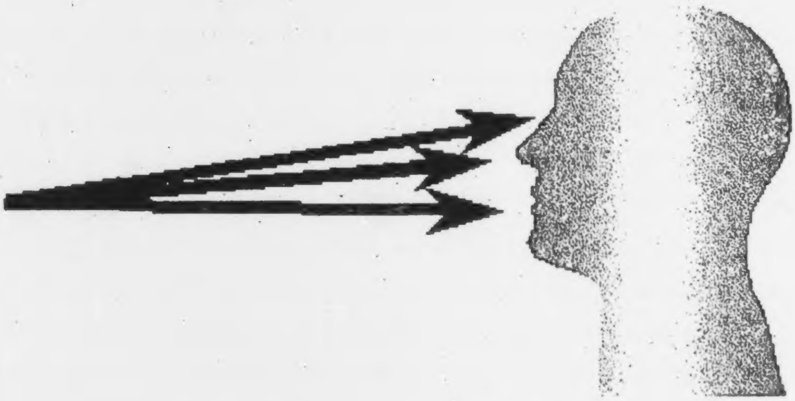
Overhead: Dangers of Hazardous Household Products

Health Problems and Injuries



- Mixtures of some hazardous products can produce dangerous vapors, explosions or fires.

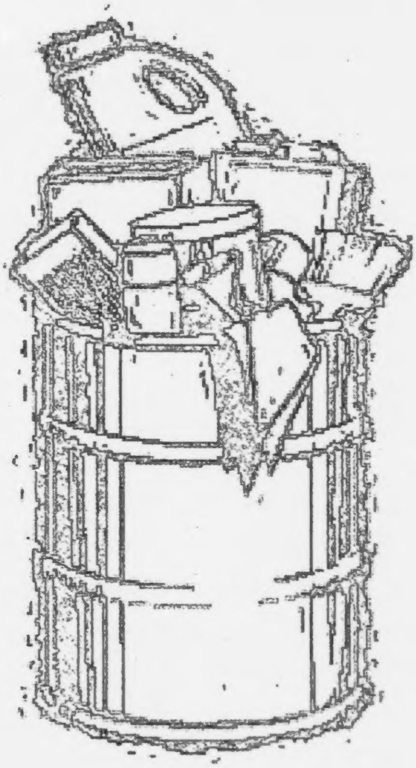
- Products containing acid or bases can burn skin, eyes or respiratory passages.



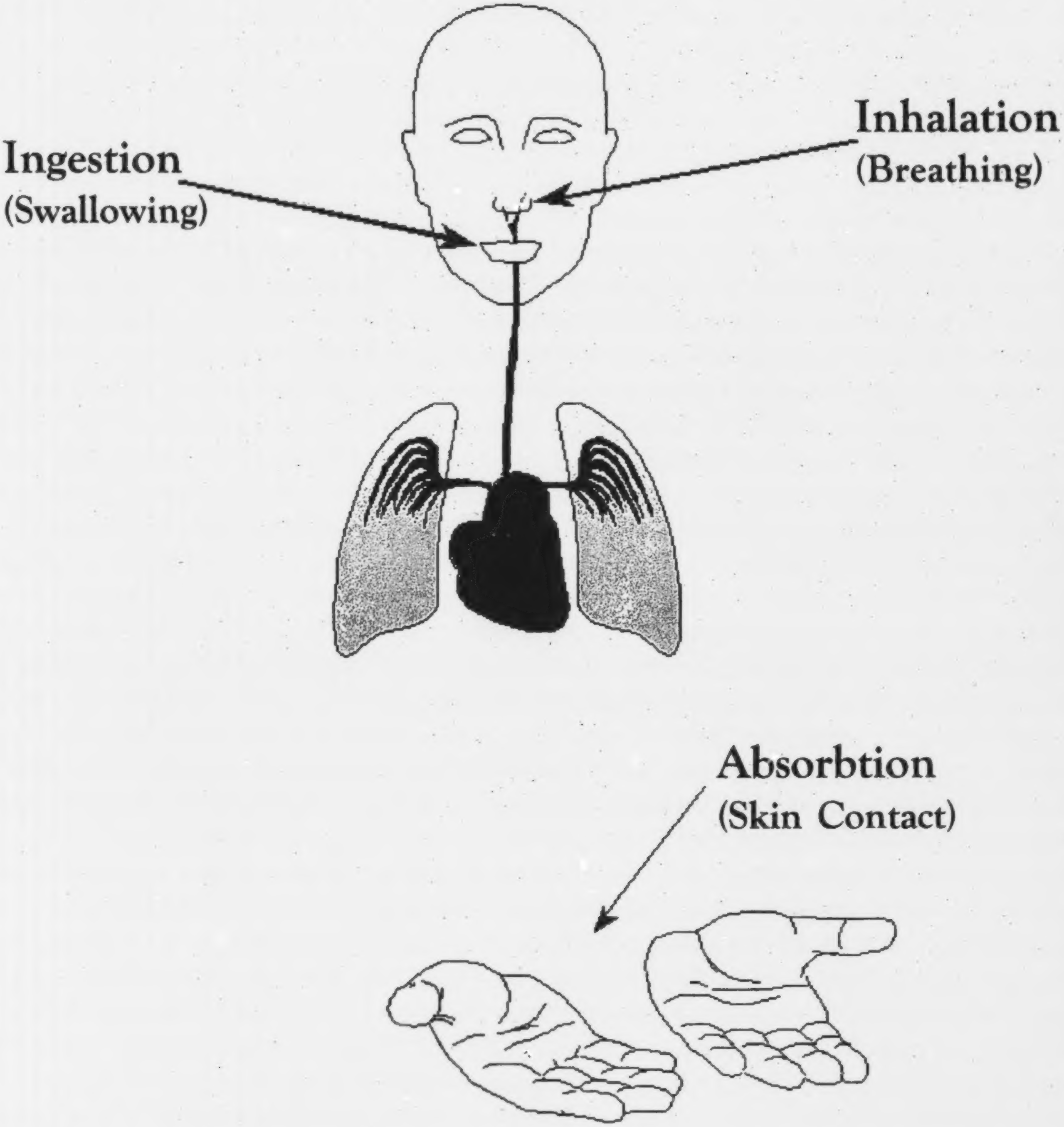
- ☠ **Exposure to some pesticides, paints and solvents can cause weakness, confusion, dizziness, irritability, headaches, nausea, sweating, tremors and convulsions.**

- ☠ **Repeated exposure to some chemicals can cause cancer or birth defects.**

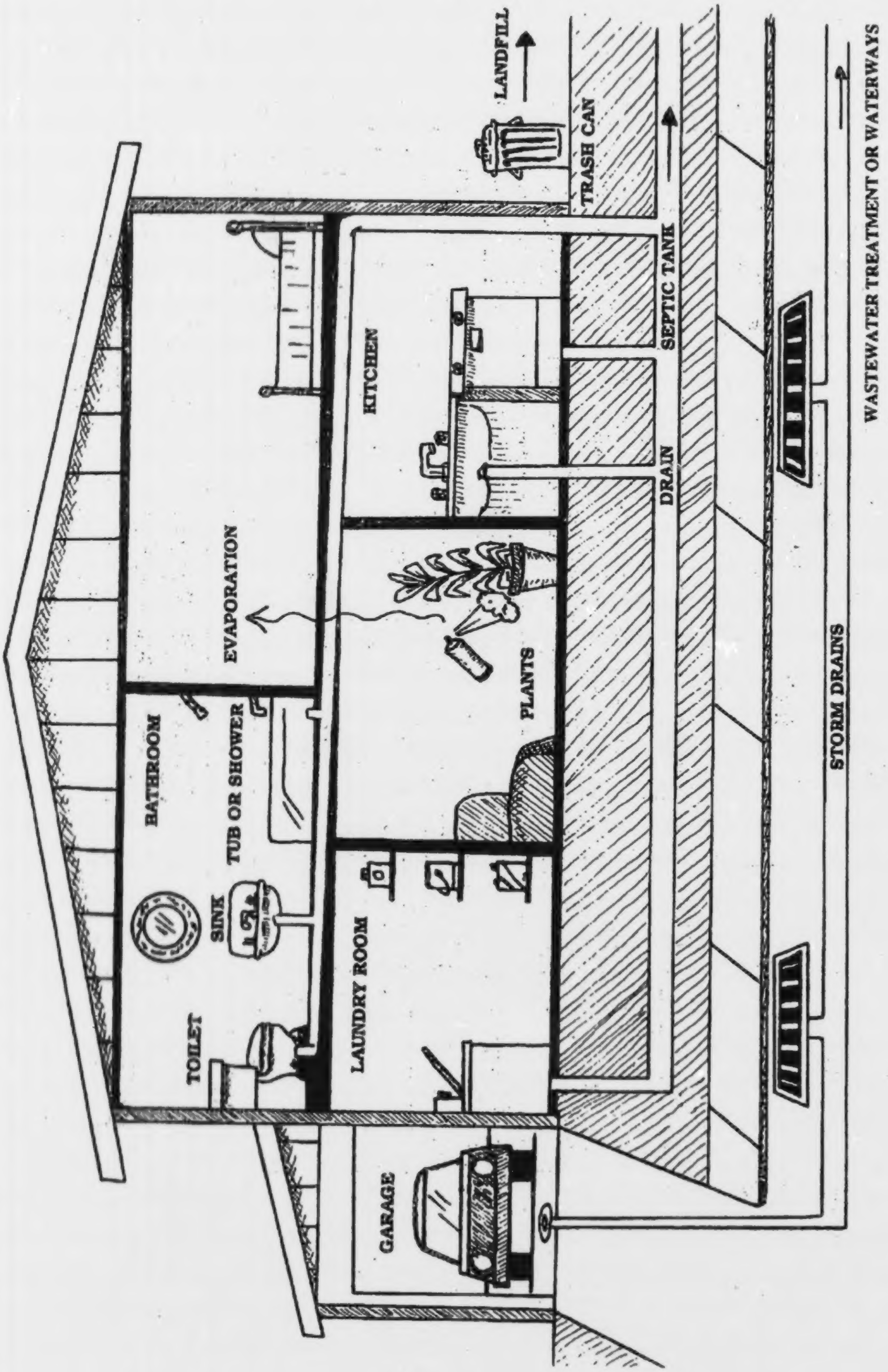
- ☠ **Hazardous materials placed in the garbage can seriously injure sanitation workers.**



Overhead: Routes of Exposure


Inhalation
(Breathing)
Ingestion
(Swallowing)
Absorbtion
(Skin Contact)

Overhead: Household Hazardous Waste Routes


LANDFILL
TRASH CAN
SEPTIC TANK
DRAIN
KITCHEN
EVAPORATION
BATHROOM
TUB OR SHOWER
SINK
TOILET
LAUNDRY ROOM
PLANTS
GARAGE
STORM DRAINS
WASTEWATER TREATMENT OR WATERWAYS

Worksheet: Words of Warning

Fill in your own definition of what you think these words mean. If you do not know, leave the space blank. Now turn the page over and look at the definitions to see if you were correct. Fill in the correct responses or add to your own.

Toxic:

Ignitable/Flammable:

Corrosive:

Reactive:

Danger:

Warning:

Caution:

Hazardous:

Poisonous:

Reactive:

Irritant:

Words of Warning: Answers

Toxic: Hazardous materials that are poisonous, harmful, destructive, or deadly

Ignitable/Flammable: Easily started on fire; capable of burning rapidly

Corrosive: Chemical agent that reacts with or attacks the surface of a material causing it to deteriorate or wear away

Danger: Warning label for hazardous substances that are extremely toxic (lethal dose is a drop to a teaspoon)

Warning: Hazardous substance label for very toxic substances (lethal dose is a teaspoon to a tablespoon)

Caution: Warning found on a moderately toxic substance (lethal dose is an ounce to a pint)

Hazardous: Substances which cause special problems because they are poisonous, explosive, corrosive of metal or skin, harbor disease-causing microorganisms, are radioactive, or are dangerous for any other reason

Poisonous: A substance that causes illness, injury, or death, particularly by chemical means

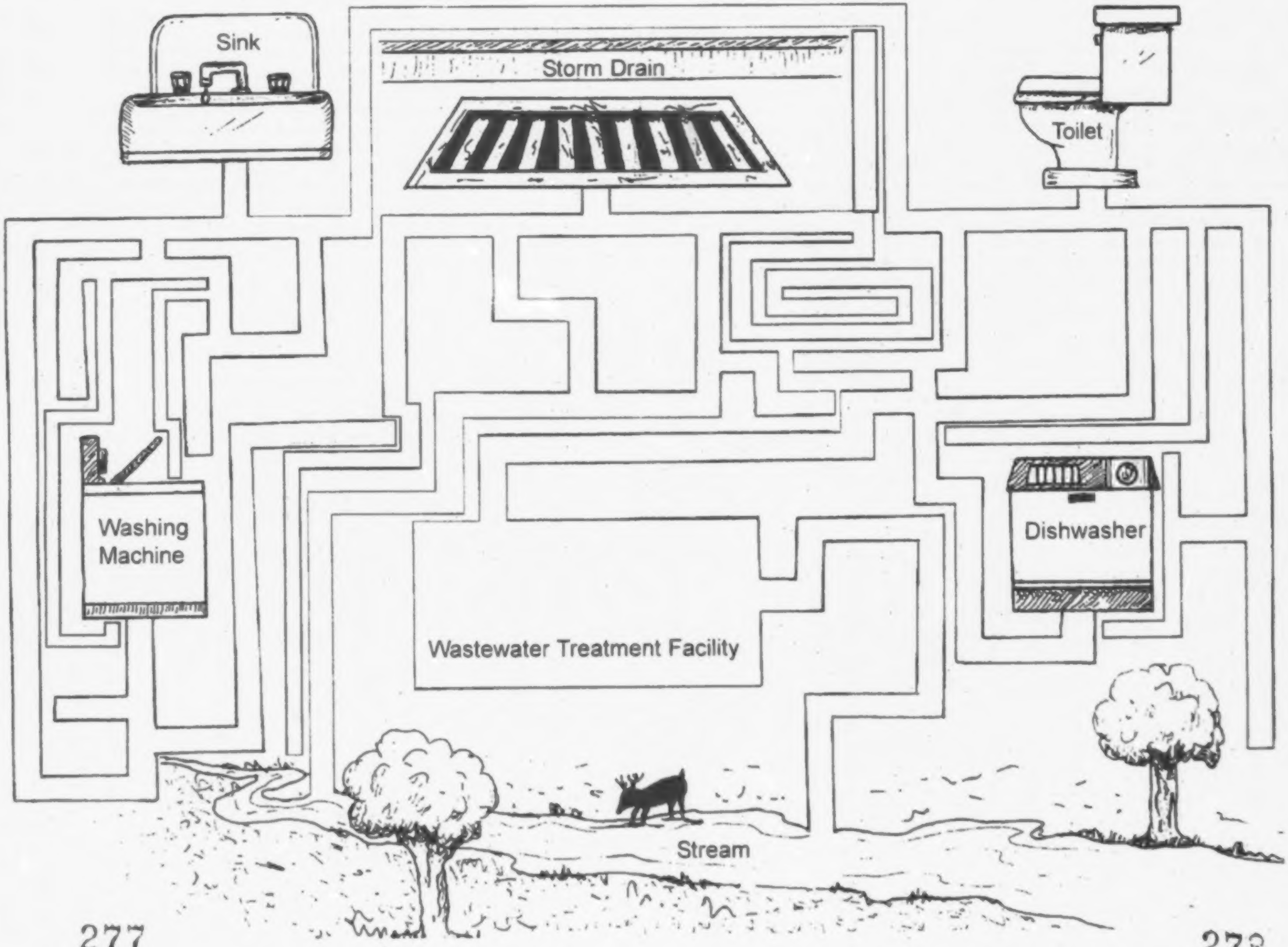
Reactive: Hazardous substance that undergoes an unwanted reaction when exposed to other substances

Irritant: Hazardous substance that causes soreness, burning or inflammation

Worksheet: Sink to Stream

Name ______________________________

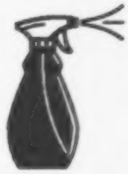
Draw a line from the sink to the stream. Using a different color for each, do the same with the toilet, the storm drain, the dishwasher, and the washing machine. Which one(s) go directly to the stream? Which one(s) go through a treatment facility?

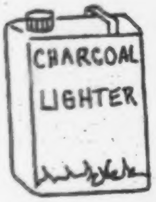

Sink
Storm Drain
Toilet
Washing Machine
Dishwasher
Wastewater Treatment Facility
Stream

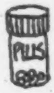
Worksheet: Identify the Hazards

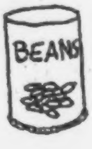
Student Name: ____

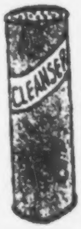
Circle the items that are most likely to be a hazard to people or the environment if used or disposed of incorrectly.

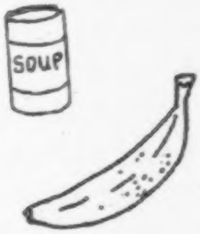


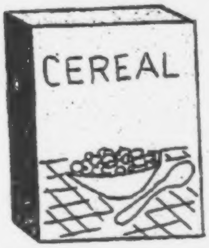

CHARCOAL
LIGHTER

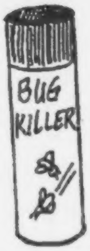


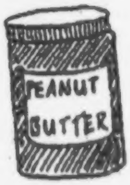


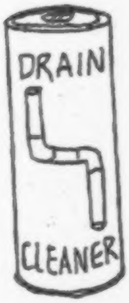


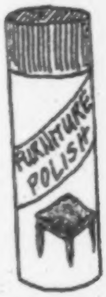


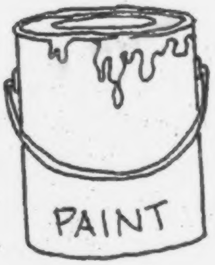


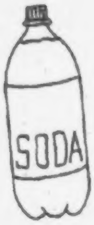


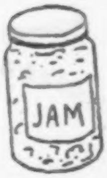

PEANUT
BUTTER

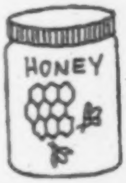

DRAIN
CLEANER

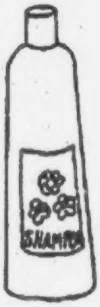

FURNITURE
POLISH

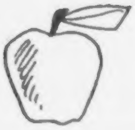












Lesson: Safe Subs

Grade: 4-5
Subject: Art, Health, Science (extension)
Objectives:
Students will:

- identify safe substitutes for various hazardous household products
- create a recipe book of safe substitutes for home use

Teaching Time: 50-60 minutes

Materials: handout, Safe Substitutes Recipes and Tips for a Safer Home; paper and markers or colored pencils or crayons to make recipe books of safe substitutes; use magazine cutouts to decorate books with nature images, if desired.

(Optional:) store bought examples of the cleaners listed on the safe substitutes handout; one or more pre-made glass cleaner from vinegar and water and towels or coffee filters for students to practice using a non-toxic cleaner--or have students make the recipe, if desired.

REDUCE
REUSE
RECYCLE

Background:

(Prerequisite: Hazardous Routes). According to national estimates, each home contains from three to eight gallons of hazardous materials in kitchens, bathrooms, garages, and basements. Throwing these items in the garbage can threaten the safety of people, animals, and the environment. The most effective way to reduce the quantity of hazardous waste pollution is to reduce the quantity of household hazardous wastes we produce. Oregon pioneers used vinegar and newspaper to clean windows and baking soda to clean their silver among other things. The way to get clothes white and ovens clean was to use "elbow grease." This lesson informs students of the common nonhazardous substitutes available to use in place of more expensive and environmentally hazardous chemicals.

Procedures:

- Review with students the meaning of the term "household hazardous waste" (see Lesson: Hazardous Routes) and have them give examples, such as pesticides, motor oil, household cleansers, and paint, etc. Hazardous wastes can be either solid, liquid, or gas, and improperly disposing of them can harm the air, water, or soil.
- Pass out the handout, "Safe Substitutes Recipes" to each student. Many hazardous products we purchase in stores are not always necessary to get the job done and may even harm us or the environment.
- (Optional) Compare these recipes to store bought examples of these products and have students read the label and discuss how the store bought version may contain chemicals that are more toxic and must be used as directed by the label. Note that these product labels may contain the label warning words: Caution, Warning or Danger.

Reflection/Response:

- Have students write and decorate a "recipe book" for the safe substitutes to household hazardous products and share with their families and friends.
- (Optional) Let students take turns cleaning with a non-toxic glass cleaner that you have made as a class or for the class.
- Give each student the handout "Tips for a Safer Home".

Extensions:

- Conduct a test of certain cleaning products to their suggested "safe substitue" alternative to compare their effectiveness. Have students record and evaluate their results.
- Find out where/when household hazardous wastes can be disposed in your area. Call the Household Hazardous Waste Hotline at: 1-800-732-9253.

Oregon Common Curriculum Goal:

Science: Scientific Inquiry

- Conduct a simple investigation and hypothesize the outcome.

Arts: Create, Present, and Perform

- Apply artistic elements and technical skills to create, present and/or perform works of art for a variety of audiences and purposes

Health Education: Safe and Healthy Environment and Controllable Health Risks and Informed Consumer

- Understand the potential influences of environmental factors on personal and public health.
- Understand and apply prevention and risk reduction strategies for health-related interventions.
- Understand and apply strategies to improve and maintain individual, family, school and community health.
- Evaluate the validity and reliability of heath-related information, products and services as a consumer or potential consumer.

Grade 5 Benchmark:

Students will:

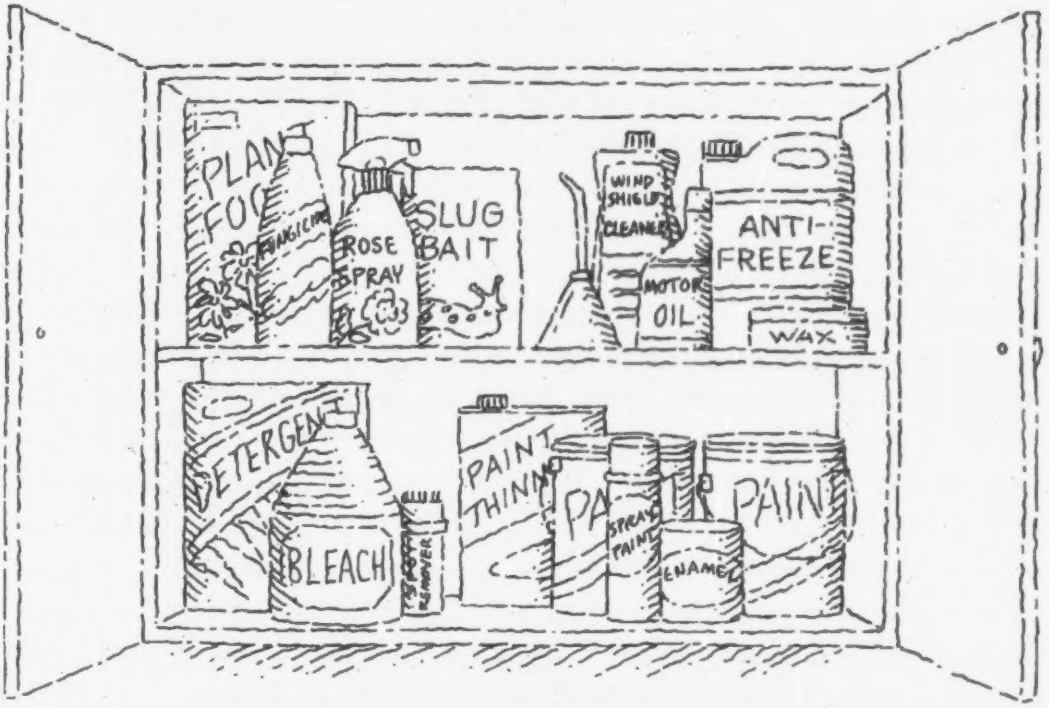
- Record, evaluate, analyze and draw conclusions from a simple investigation.
- Determine information from the data which could be used to conduct a further investigation.
- Create, present and/or perform a work of art, using experiences, imagination,

Handout: Tips for a Safer Home

Dear Parent:
Your child has recently been learning about products in the home that are potentially dangerous to people, wildlife and the environment if used or disposed of improperly. The following worksheet has some tips for dealing with chemicals in your home and will help you and your child identify products that should be used and disposed with care.

Safe Use and Disposal Tips

- ➢ Always buy the least toxic product necessary to do the job. Avoid products with the words CAUTION, WARNING, DANGER, or FLAMMABLE on the label.
- ➢ Buy the smallest container necessary to accomplish your task to avoid having left overs.
- ➢ Follow the instructions carefully and try to use up the product as intended or give left overs to someone else who can use it.
- ➢ Never pour hazardous products into storm drains or onto the ground.
- ➢ Don't mix hazardous chemicals or store them in unlabeled containers.
- ➢ Do take hazardous chemicals and cleaners to a household hazardous waste collection center or special collection event.
- ➢ Do take used motor oil to a service station or authorized dealers for recycling.
- ➢ Contact your local solid waste official to find out how to properly dispose of any questionable materials, if you are not aware of any special collection events or facilities in your area or call the HHW hotline for more information 1-800-732-9253 or 503-229-5913 in the Portland area.


PLANT FO
FUNGICIDE
ROSE SPRAY
SLUG BAIT
WINDSHIELD CLEANER
ANTI-FREEZE
MOTOR OIL
WAX
DETERGENT
BLEACH
SPOT REMOVER
PAINT THINNER
PA
SPRAY PAINT
ENAMEL
PAINT

Handout: Safe Substitutes Recipes

Air Freshener

A few cotton balls
Place a few drops of vanilla extract onto the cotton balls and set inside a cup or bowl
Good for the home, car, or refrigerator.

Vanilla Extract

For unpleasant odors:
Boil 1 TBL of white vinegar in 1 cup of water.

Drain Maintenance

1/2 cup of baking soda in the drain
Follow with 1/2 cup of vinegar
Cover and allow to sit for 15 minutes.
Rinse with 2 quarts of boiling water.
Do this regularly to keep drains fresh and to help prevent clogs.

BAKING
SODA

Glass Cleaner

1 quart of warm water
1/4 cup of white vinegar or 2 TBL of lemon juice
Mix and store in a spray bottle. Coffee filters make good glass cleaning rags and can be composted!

Distilled
White
Vinegar

Vinyl Floor Cleaner

1 gallon of warm water
1/2 cup of white vinegar or 1/4 cup of borax
Mix in a bucket and mop as you normally would.

Moth Balls

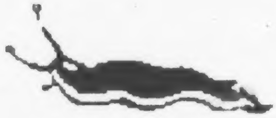
Store wools in sealed plastic bags or airtight containers.
Place garments in the freezer for several days to kill moths or larvae.
Vacuum rugs, carpet and upholstered furniture regularly.

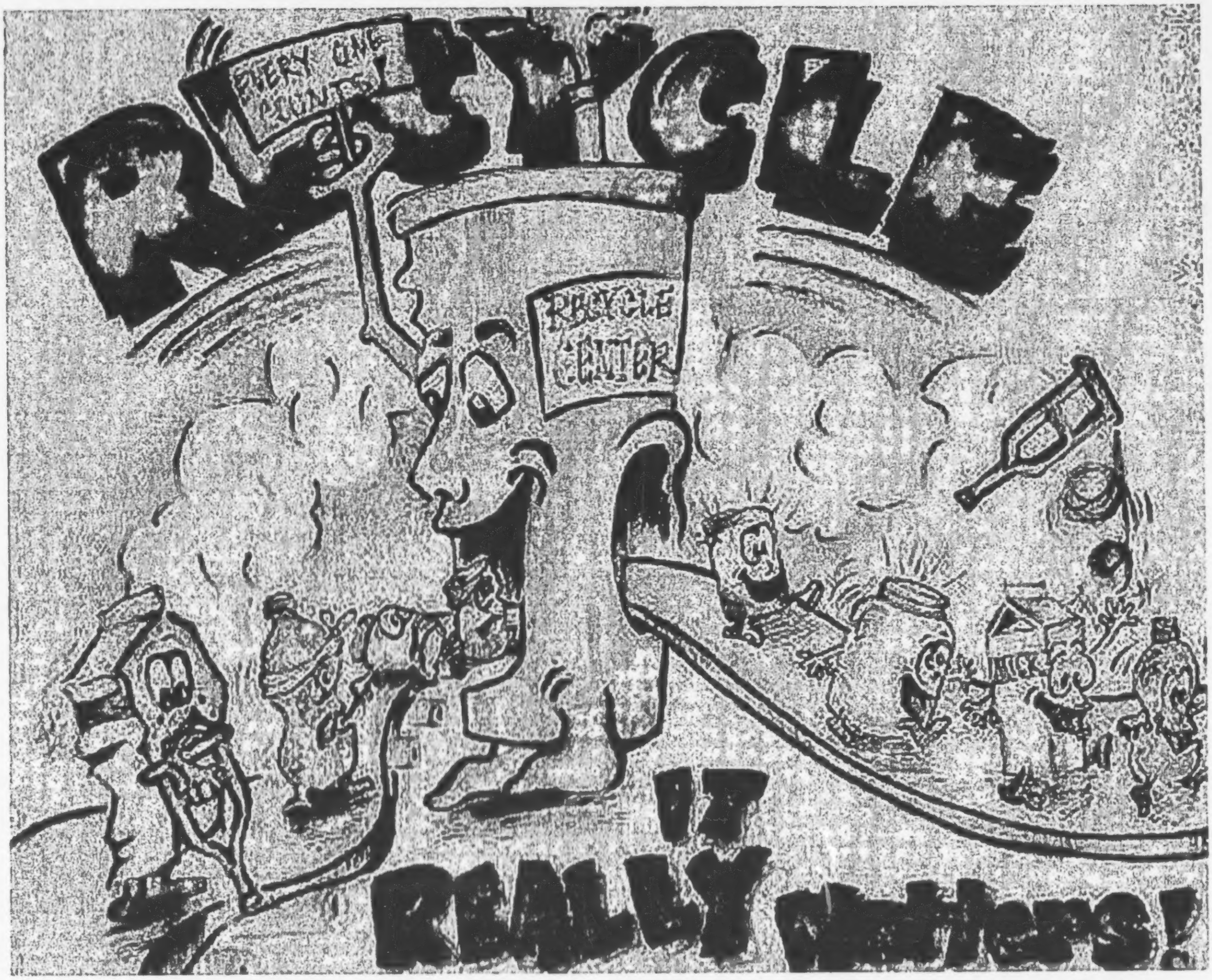
Fertilizer

Amend your soil with a 2/3 soil to 1/3 compost ratio. This will add nutrients, help the soil retain water and keep plants hardy without the use of chemical fertilizers.

Slug Removal

Create slug traps with plastic food tubs. Cut several 1-inch square openings around the tub about 2-3 inches from the bottom. Place tub into the ground so that the openings are just above ground level. Fill tub with 1/2 inch of beer or yeast mixture and cover with lid. Empty every couple of days.
Yeast mixture: 2TBL flour, 1/2 tsp of baker's yeast, 1 tsp of sugar in 2 cups of warm water.




RECYCLE
EVERY ONE COUNTS!
RECYCLE CENTER
IT REALLY Matters!

Artwork by Amber Axtell, McMinnville High School, 2000 Recycling Awareness Week Poster Contest, sponsored by City Sanitary & Recycling Service (Yamhill County) - First Place, High School Division

The following list of software and on-line addresses focuses on integrated waste management issues and projects topics:

Software

Choices, Choices: Kids And The Environment, Mac/Win, Tom Snyder Productions, 80 Coolidge Hill Road, Watertown, MA 02172, 800-342-0236.

Decisions, Decisions: The Environment, Mac/Win, Tom Snyder Productions, 80 Coolidge Hill Road, Watertown, MA 02172, 800-342-0236.

EarthAware, Mac/Win, EnviroAccount Software, 605 Sunset Court, Davis, CA 95616.

Earth Explorer, Mac/Win, Sunburst Communications, Inc., 101 Castleton Street, P.O. Box 100, Pleasantville, NY 10570, 800-321-7511.

EcoExpert Environmental Science Series (Case Of The Polluted Playground), IBM, Texas Learning Technology Group, P.O. Box 2947, Austin, TX 78768, 800-580-8584.

EcoExpert Environmental Science Series (Fuel Site Quandary), IBM, Texas Learning Technology Group, P.O. Box 2947, Austin, TX 78768, 800-580-8584.

Garbage Tale: An Environmental Adventure, Laserdisc, SVE/Churchill Media, 6677 N. Northwest Highway, Chicago, IL 60631-1304, 800-829-1900.

Introduction To General Environmental Studies: Waste, Mac/IBM, Compress. Available From Education Software Institute, 4213 South 94th Street, Omaha, NE 68127, 800-955-5570.

Kids' Network: Too Much Trash?, Mac/Win, National Geographic Society, Educational Media Division, P.O. Box 98018, Washington, DC 20090, 800-368-2728.

Our Environment, Mac/Win, Sunburst Communications, Inc., 101 Castleton Street, P.O. Box 100, Pleasantville, NY 10570, 800-321-7511.

Roscoe's Totally Cycled World, Mac/Win, Steel Recycling Institute, 680 Andersen Drive, Pittsburgh, PA 15220, 800-876-7274.

Science And The Environment, Mac/Win, Dos, Unix, Environmental Media Corporation, P.O. Box 99, Beaufort, SC 29901, 800-368-3382.

SimEarth Classic, Mac/Win, Maxis, 2121 North California Blvd., Suite #600, Walnut Creek, CA 94596, 510-933-5630.

Think Earth/Captain Energy And His EcoAdventures!, Mac/Win, MultiMedia Associates. Available From Education Software Institute, 4213 South 94th Street, Omaha, NE 68127, 800-955-5570.

Trash Goes To School, IBM, Cornell Cooperative Extension, Resource Center, 7 Business & Technology Park, Cornell University, Ithaca, NY 14850, 607-255-2080.

REDUCE
REUSE
RECYCLE

Internet Addresses

COMPOSTING:

California Integrated Waste Management Board, www.ciwmb.ca.gov/organics/
Composting For Home Gardens, www.ces.ncsu.edu/hil/hil-8100.html
Concordia Student Union, www.cug.concordia.ca/~csu/handbook/enviro/composting.html
Cornell University/Cornell Composting, www.cals.cornell.edu/dept/compost
Cornell Composting/Composting In Schools, The Cornell Waste Management Institute, Cornell Center For The Environment, www.cfe.cornell.edu/compost/schools.html
Home Composting The Easy Way, www.zapcom.net/~compost/
The Master Composter, www.mastercomposter.com
Michigan State University Extension/Backyard Composting, www.gvrd.bc.ca/waste/bro/swbckyr.html.
North Carolina Cooperative Extension Service (Composting For Home Gardens), www.ces.ncsu.edu/hil/hil-8100.html
Planet Natural, www.palnetnatural.com/composting.html
Oregon Department of Environmental Quality, www.deq.state.or.us/wmc/solwaste/compostbrochure.html
Rot Web, www.net.indra.com/~topsoil/Compost/menu.html
The Compost Recipe, www.gov.nb.ca/environm/comucate/compost/nurep.htm
Veggies Unite! What Not To Compost, www.vegweb.com/composting/what-not.shtml

ENVIRONMENTAL EDUCATION:

California Department Of Education, Office Of Environmental Education, www.cde.ca.gov/cilbranch/oee/
California Environmental Education Resource Guide, www.cde.ca.gov/cilbranch/oee/ceerg/cover.html
Center for Environmental Education, www.uni.edu/ceee/simplify/
E Patrol, E Patrol Foundation, www.sprint.com/epatrol/
Educational Resources Information/Clearinghouse For Science, Mathematics, And Environmental Education (CSMEE), www.ericse.org
EE Link, www.eelink.net/html/easysearch.html
ENC Resource Finder, Eisenhower National Clearinghouse, www.enc.org.
Environmental Education Association of Oregon, www.teleport.com/~clearing/eeao/
Environmental Education And Training Partnership (EETAP), www.eetap.org
Environmental Literacy Council, www.enviroliteracy.org
Generation Earth, www.generationearth.com
Green Teacher, http://www.greenteacher.com/
National Consortium For Environmental Education And Training, www.nceet.snre.umich.edu/nceet.html
National Consortium For Environmental Education And Training, www.nceet.snre.umich.edu/nceet.html
North American Association Of Environmental Education, www.naaee.org
Oregon Forestry Education Program, www.cof.orst.edu
Searching SEEK (Sharing Environmental Education Knowledge), www.seek.state.mn.us/search/search.cfm/
The Environmental Education Network, www.envirolink.org/enviroed/
The Global Thinking Project, Georgia State University, www.teaparty.terc.edu/comweb/globalthinking/home/glothinking.htm
U.S. Environmental Protection Agency, Teachers and Kids, http://www.epa.gov/epahome/students.htm

HAZARDOUS WASTE:

Environmental Defense Fund, www.edf.org
Environmental Protection Agency,
 www.epa.gov/grtlakes/seahome/housewaste/src/open.htm
Metro Regional website, www.metro-region.org/rem/hazw/hazwas.html
Oregon Department of Environmental Quality,
 www.deq.state.or.us/wmc/solwaste/hhw.html
Recycled Battery & Reuse Coalition, www.rbrc.org

RECYCLING:

40 Tips To Go Green, www.ceres.ca.gov/calweb/40tips.html
America Recycles Day, www.americarecyclesday.org/ard/index.asp
Association of Oregon Recyclers, www.aorr.org
California Integrated Waste Management Board, www.ciwmb.ca.gov/recycle/
Can Manufacturers Institute, www.cancentral.com
City of Eugene, Solid Waste & Recycling,
 www.ci.eugene.or.us/pdd/swr2/solidwaste&recyclingprogramservices.htm
City of Portland, Bureau of Environmental Services, www.enviro.ci.portland.or.us/
Clackamas County Recycling, aquatic.co.clackamas.or.us/dtd/garb/grb_recy.html
Douglas County's Recycle Power, www.co.douglas.or.us/recycle/
Environmental Systems Of America (Recycling Factoids),
 www.envirosystemsinc.com/factoids.html
Environmental Web Directory, www.webdirectory.com/Recycling/
Global Recycling Network, www.grn.com/
Marion County, www.open.org/~mswm/swm_home.htm
Mid Valley Garbage and Recycling Association,
 www.mrtrashrecycles.com/index.html
Mississippi State University: Paper Recycling,
 www.ext.msstate.edu/pubs/pub1670.htm
Natural Resource Defense Council (Garbage And Recycling),
 www.mail.igc.apc.org/nrdc/bkgrd/gatten.html
Oregon Green Schools Association, www.oregongreenschools.org
Oregon Local Government Recycling Contacts,
 www.deq.state.or.us/wmc/solwaste/contact.html
Oregon Recycling Programs, www.deq.state.or.us/wmc/solwaste/orrecycpro.html
Pennsylvania Used Oil Recycling Information Center, www.dep.state.pa.us
POPSI Environmental Education Program, www.popsi.com
Recycle City, Environmental Protection Agency Region 9,
 www.epa.gov/region09/recyclecity/
Recycling Slide Show, Recycle America,
 www.crest.org/environment/growth/general/recycle-slides/index.html
The Recycling Team, Conservation for Central Oregon, www.recyclingteam.org/
Recycler's World, www.recycle.net/
Salem Recycling Index, www.oregonlink.com/index.html#recycling
Steel Recycling Institute, www.recycle-steel.org
Think Earth, www.edspecialists.com
TreePeople: Generation Earth Program, www.generationearth.com
United States Environmental Protection Agency,
 www.epa.gov/epaoswer/non-hw/recycle/index.htm
Washington County Cooperative Recycling Program,
 www.co.washington.or.us/deptmts/hhs/wste_rcy/contacts.htm
Wisconsin Department Of Natural Resources/EE For Kids,
 www.dnr.state.wi.us/eek
Yamhill County Solid Waste, www.ycsw.org/
Youth Recycling, www.unesco.org/youth/recycle.htm

REDUCE
REUSE
RECYCLE

Internet Addresses

REUSE:

Clothing Donation, www.charityguide.org/fewhours/clothesdrive.htm
School and Community Reuse Action Project (SCRAP), www.scrapaction.org
Resource Revival, www.resourcerevival.com
Reuse Development Organization, www.redo.org/

SOLID WASTE AND RESOURCE MANAGEMENT:

Aluminum Association, www.aluminum.org/
American Forest & Paper Association, www.afandpa.org/
American Petroleum Institute, www.api.org/tchrmaterial.htm
American Plastics Council, www.plastics.org
Aseptic Packaging Council, www.aseptic.org
BFI Company/Landfills, www.bfi.com/landfill/index.html
California Integrated Waste Management Board, www.ciwmb.ca.gov
CERES (California Environmental Resources Evaluation System), ceres.ca.gov/education/
Environmental Industry: Professionally Managed Landfills: A Vital Environmental Resource, www.envasns.org/eii/garbage/landfills.htm
Mel's Sanitary Service of Tygh Valley, www.melssanitaryserviceinc.com
Metro Regional Government, www.metro-region.org/
Oregon City Garbage Company, www.oregoncitygarbageco.com/
Oregon Department of Environmental Quality, www.deq.state.or.us/wmc/solwaste/rsw.htm
Plastic Bag Information Clearinghouse, www.plasticbag.com
Society of Plastics Industry, www.socplas.org/
Steel Recycling Institute, www.recycle-steel.org
Thompson Sanitary Service of Newport, www.thompsonsanitary.com/
U.S. Department of Interior The Natural Resources Library, www.ios.doi.gov/nrl/
U.S. EPA Office Of Solid Waste: Safer Disposal For Solid Waste, The Federal Regulations For Landfills, www.epa.gov/epaoswer/non-hw/muncpl/safedis.htm
Waste Management Northwest, www.wmnorthwest.com

SOURCE REDUCTION:

County of Stanislaus, the Citizen's 3 R's of Garbage, www.co.stanislaus.ca.us/er/3rsgarb.htm
Commercial Waste Reduction Clearinghouse (sponsored by Oregon DEQ), www.deq.state.or.us/wmc/cwrc.html
Conservation Education Program, www.fs.fed.us/outdoors/nrce/welcome.htm
Do It Yourself: Stop Junk Mail And Phone Calls, www.obviously.com/junkmail/
EPA Resource Guide Of Solid Waste Educational Materials, U.S. Environmental Protection Agency, www.epa.gov/epaoswer/general/bibligr/educatn.htm
Flexible Packaging Educational Foundation, www.flexpack.org
Guideline For Environmentally Responsible Packaging, www.corp.hp.com/publish/talkpkg/enviro/environm.htm
HP Externally Packaging Web Site Guideline For Environmentally Responsible Packaging, www.corp.hp.com/publish/talkpkg/enviro/environm.htm
It's Your Choice, www.cygnus-group.com/packaging/Flex/pkging.html
Metro Regional website, www.metro-region.org/rem/rwp/waste_prev_tips.html
Michigan State University Extension, Waste Reduction-For Home And Office, www.msue.mus.edu/msue/imp/mod02/01500569.html
National Waste Prevention Coalition, http://dnr.metrokc.gov/swd/nwpc/index.htm
Newton's Apple: Garbage KTCA Twin Cities Public Television/NSTA, www.ktca.org/newtons/11/garbage.html
State Of Iowa Energy Education, www.state.ia.us/government/dnr/organiza/egd/chap7.htm
U.S. EPA Office Of Solid Waste, www.epa.gov/osw/students.htm

SUSTAINABILITY:

Center of Excellence for Sustainable Development,
www.sustainable.doe.gov/overview/ovintro.htm
Oregon Solutions.net, www.oregonsolutions.net/tools/tools/index.cfm
Northwest Environment Watch, www.northwestwatch.org
Sustainability.com, www.sustainability.com
Sustainable Northwest, www.sustainablenorthwest.org
Union of Concerned Scientists, www.ucsusa.org

VERMICOMPOSTING:

Alaska's Can-O-Worms, www.can-o-worms-alaska.net/
Biological Homegrown Farms, www.freeyellow.com/members/biohomegf/index.html
California Integrated Waste Management Board,
www.ciwmb.ca.gov/schools/classroom/worms.htm
Canada's Office Of Urban Agriculture/City Farmer, www.cityfarmer.org/
Classroom Vericomposting, www.interware.net/~levine/worms/
Lake County Worm Farm, Inc., www.pacific.net~wormfarm/
New Jersey Online, www.nj.com/yucky/worm/
Progressive Organic Solutions, www.vermicentral.com/
Sale Of Worms And Worm Castings,
www.worm-publications.com/growers/oasiswfs.html
University Of Nebraska Cooperative Extension,
www.ianr.unl.edu/ianr/lance/enviro/pest/factwheets/vermich.html
Vermico's Casting Call, www.vermico.com/news.html
Vermiculture, North Carolina State University, Wiggling N'Vermicomposting,
www.home.att.net/~tnoloand/
Worm Digest, www.wormdigest.org/
Worm Woman's Web Site, www.wormwoman.com/frameindex.html
Worm World, www.globalclassroom.org/worms.html

REDUCE
REUSE
RECYCLE

Children's Books by Theme/Subject

Art

Creating by Recycling (Crafts for All Seasons), Laia Sadurni and Anna Llimos, Ages 9-12, Blackbirch Marketing, January 2000.

Earth-Friendly Holidays: How to Make Fabulous Gifts and Decorations from Reusable Objects, George Pfiffner, Ages 9-12, John Wiley & Sons, 1995.

Ecoart!: Earth-Friendly Art and Craft Experiences for 3-To 9-Year-Olds , Laurie Carlson, Ages 4-8, Econo-Clad Books, 1999.

Eco-Arts & Crafts (Target Earth), Stuart A. Kallen, Ages 9-12 , Abdo & Daughters, September 1993.

Ecology Crafts for Kids : 50 Great Ways to Make Friends With Planet Earth, Bobbe Needham, Ages 9-12, Sterling Publications, August 1999.

Nature Crafts for Kids, Gwen Diehn, Terry Krautwurst (Contributor), Sterling Publications, August 1997.

Composting/Gardening

A Child's Organic Garden, Lee Fryer, Leigh Bradford, Judith Goodman, Ages 9-12, Earth Foods Associates, October 1989.

Compost! : Growing Gardens from Your Garbage, Linda Glaser, Ages 4-8, Millbrook Press Trade, January 1996.

Gardens from Garbage: How to Grow Indoor Plants from Recycled Kitchen Scraps, Judith Handelsman, Ages 9-12, Econo-Clad Books, October 1999.

Native American Gardening: Stories, Projects and Recipes for Families, Michael J. Caduto, JosephBruchac, Gary Paul Nabhan, Fulcrum Publishers, April 1996. Illustrates natural gardening, seed preservation, and the cycles of nature.

Recycle With Earthworms: The Red Wiggler Connection, Shelley C. Grossman, Toby Weitzel, Lucy Warren (Editor), I Donnabella, Shields Publishing, 1997.

There's a HAIR in my dirt! A worm's story, Gary Larson, Harper Collins Publishers, 1998.

Worms Eat My Garbage: How to Set Up & Maintain a Worm Composting System, Mary Appelhof, Ages 9-12, Flowerfield Press, Revised edition November 1997.

Ecology

Backyard (One Small Square), Donald M. Silver, Ages 4-8, McGraw-Hill Professional Publishing, 1997. Teaches children the wonders of sight, sense, and sound exploration in their own backyard.

In a Nutshell (Sharing Nature With Children Book), Joseph Anthony, Ages 4-8, Dawn Publishing, September 1999.

Journey Through the Northern Rainforest, Karen Pandell, Ages 9-12, Dutton Books, October 1999. This book lucidly presents a discussion of the environmental hazards to the northern rainforest. However, some knowledge of this ecosystem is assumed, so teachers should precede this book with an overview of various forest ecosystem types.

Hazardous Waste

The Chemo Kid: A Novel, Robert Lipsyte, HarperCollins Inc., 1992. When the drugs he takes as part of his chemotherapy suddenly transform him from wimp into superhero, sixteen-year-old Fred and his friends plot to rid the town of its most lethal environmental hazard: toxic waste in the water supply.

Hazardless Home Handbook, Oregon Department of Environmental Quality and Metro Regional Government. This is a reference guide that teachers can use to enhance their lessons about toxic and poisonous products that are dangers to children. To order in the Portland Metro Regional Area call: For the rest of the state call 1-800-452-4011 or 503-229-5913.

Poison in Paradise!, Diana G. Gallagher, Ages 9-12, Minstrel Books, October 1996. Alex discovers that Paradise Valley Chemical is dumping barrels of toxic waste into a nearby lake. For the Native American reservation that borders the lake, the waste is an ecological time bomb.

History

The Environmental Movement: From Its Roots to the Challenges of a New Century, Laurence Pringle, Ages 9-12, Harper Collins Juvenile Books, April 2000.

Kid's Research Materials

Children's Atlas of the Environment, Rand McNally & Co., 1991. Maps and text portray the world's ecosystems, environmental concerns, and positive suggestions of what can be done to help the planet.

The Encyclopedia of the Environment (Reference, Watts Encyclopedia Series), Stephen Kellert (Editor), Matthew Black (Editor), Ages 9-12, Franklin Watts, September 1999.

Facts on File Environment Atlas, David Wright, Ages 9-12, Checkmark Books, January 1998.

Uxl Encyclopedia of Native American Tribes: California, Pacific Northwest (U.X.L Encyclopedia of Native American Tribes), Sharon Malinowski (Editor), Anna Sheets (Editor), Linda Schmittroth (Editor), Ages 9-12, Hardcover Vol 004, UXL, June 1999.

Litter

The Care Bears and the Big Cleanup, Bobbi Katz, Ages 4-8, Random House, Inc., 1991. When Lisa and Simon move to the country and discover that litter is ruining the woods, they join forces with the Care Bears to motivate the community into organizing the Big Clean-up.

The Great Trash Bash, Loreen Leedy (Illustrator), Ages 4-8, Holiday House, September 2000. When the animals realize that their town is being littered up, they come up with ideas for solving this garbage problem.

The Wartville Wizard, Don Madden, Ages 4-8, Aladdin Paperbacks, March 1993. Wartville is being buried under trash, until one day the wizard figures out how to solve the problem.

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Children's Books by Theme/Subject

Math

1 2 3 Moose: A Pacific Northwest Counting Book, by Andrea Helman, Ages 4-8, Sasquatch Books, September 1996. Teaches mather and science concepts by integrating animals, plants, and natural resource explantions to go along with the counting.

Ecology Math: Grade 4 and Above, Ages 9-12, American Education Pub., June 1994. The author presents 17 lessons on simple ecology with discussion and information sheets. Teacher answer keys provided.

Natural Resources

3 Pandas Planting, Megan Halsey, Ages 4-8, Aladdin Paperbacks, April 2000.

Aani and the Tree Huggers, Jeannine Atkins, Ages 4-8, Lee & Low Books (April 2000).

After the Spill: The Exxon Valdez Disaster, Then and Now, Sandra Markle, Ages 9-12, Walker & Company, May 1999.

Agatha's Feather Bed: Not Just Another Wild Goose Story, Carmen Deedy, Ages 4-8, Econo-Clad Books, 1999. When Agatha buys a new feather bed and six angry naked geese show up to get their feathers back, the incident reminds her to think about where things come from.

The Berenstain Bears Don't Pollute (Anymore), Stan and Jan Berenstain, Ages 4-8, Random House, Inc., 1991. The bears in Bear Country grow concerned about how pollution and waste of natural resources are damaging the world around them, so they form the Earthsavers Club.

Earth: Where Would We Be Without It?, Kathy Kranking, Ages 4-8, Golden Books Publishing, February 1999. Highlights all the wonderful things that Earth gives us.

If I Touched an Eagle, Joan D. Stamm, Young Adult, Royal Fireworks Press, March 1995. This is an extended tale about a girl in Kodiak Alaska who wants to be a marine biologist and how she deals with the aftermath of the Exxon Valdez oil spill.

Peter's Place, Sally Grindley, Ages 4-8, Gulliver Books, June 1996. A tale about a boy who lives by the sea and loves the beach and how he deals with environmental pollution from an oil spill.

The Wump World, Bill Peet, Ages 4-8, Houghton-Mifflin, 1981. Aliens from the planet Pollutus devastate the gentle Wumps' grassy, leafy world. After total exploitation, the Pollutians, leave to ravage another planet. A first green sprout shows again.

Native American/Other Cultures

And the Green Grass Grew All Around: Folk Poetry from Everyone , Alvin Schwartz, Ages 9-12, Harpercollins Juvenile Books, April 1999.

Brother Eagle, Sister Sky!: The Words of Chief Seattle, Susan Jeffers (illustrator), Ages 4-8, Dial Books for Young Readers, 1991. A Snoquamish Indian chief describes his people's respect and love for the earth, and concern for its destruction.

Earth Tales from Around the World, Michael J. Caduto, Fulcrum Publishers, October 1997. A collection of 48 traditional tales about human's relationship with nature.

The Earth Under Sky Bear's Feet: Native American Poems of the Land, Joseph Bruchac, Ages 4-8, Paper Star, September 1998.

Keepers of the Earth: Native American Stories and Environmental Activities for Children, Michael Caduto, Fulcrum Publishing, Young Adult, Nov. 1999.

Native American Gardening: Stories, Projects and Recipes for Families, Michael J. Caduto, JosephBruchac, Gary Paul Nabhan, Fulcrum Publishers, April 1996. Illustrates natural gardening, seed preservation, and the cycles of nature.

The Earth is Sore: Native Americans on Nature, Aline Amon, Ages 9-12, McClelland & Steward, Ltd and American Book, 1981. This book features a collection of Native American speech excerpts and writings on appreciation of the environment and their perspective on "white man's" cultural view of the environment.

Native Plant Stories, Joseph Bruchac, Michael J. Caduto, Young Adult, Fulcrum Publishers, April 1995. Collections of stories by 18 different North and Central American tribes which offer precautionary tales about human's interaction with plants.

Pushing Up the Sky: Seven Native American Plays for Children, Joseph Bruchac, Ages 7-12, Dial Books for Young Readers, 2000.

Poetry

And the Green Grass Grew All Around: Folk Poetry from Everyone, Alvin Schwartz, Ages 9-12, Harper Collins Juvenile Books, April 1999.

The Blue & Green Ark: An Alphabet for Planet Earth, by Brian Patten Ages 4-8, Scholastic Trade, March 2000

The Earth Is Painted Green: A Garden of Poems About Our Planet, Barbara Brenner (Editor), Ages 4-8, Scholastic Trade, March 2000.

The Earth Under Sky Bear's Feet : Native American Poems of the Land by Joseph Bruchac, Ages 4-8, Paper Star, September 1998.

The Mists of Eden: Nature's Last Paradise, Erica Sherman, Nancy R. Thatch (Editor), Ages 4-8, Landmark Editions, August 1998.

Old Elm Speaks: Tree Poems, Kristine O'Connell George, Ages 4-8, Houghton Mifflin Co., September 1998.

Water Music : Poems for Children, Jane Yolen, Ages 9-12, Boyds Mills Press, October 1995.

Recycling

50 Simple Things Kids Can Do to Recycle, Earthworks Group, 1994.

365 Ways To Reduce, Reuse and Recycle, Diane Hilow, Amigos de Arizona, Inc., October 2000.

How on Earth Do We Recycle. . . (Glass?) (Metal?) (Paper?) (Plastic?), Millbrook Press, Brookfield, CT, various authors, 1992. Series of books that describe the process of making and recycling each product, including ways to reuse materials for various creative projects.

Recycle!: A Handbook for Kids, Gail Gibbons, Little, Brown & Co. Inc., 1996. Explains process of recycling from start to finish and discusses what happens to paper, glass, aluminum cans, and plastic when they are recycled into new products.

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Recycle That! (Rookie Read-About Science), Fay Robinson, Allan Fowler, Ages 4-8, Children's Press, Reprint edition October 1995.

Recycled Paper: From Start to Finish (Made in the USA), Samuel G., Blackbirch Marketing, September 2000.

The Recycler's Handbook: Simple Things You Can Do, EarthWorks Press, 1990.

Recycling, Angela Royston, Ages 4-8, Raintree Steck-Vaughn Publishers, 1999. Presents simple ideas about waste disposal, recycling, energy savings, reuse, etc. with vivid pictures.

Recycling (Earth at Risk), Rebecca Stefoff, Ages 9-12, Chelsea House, 1991. Analyzes society's wastes, traces the waste stream and how recycling and reuse minimize waste problems.

Recycling (New True Book), Joan Kalbacken and Elilie Lepthien, Ages 4-8, Children's Press, Chicago, 1991. Shows how ever-growing tide of refuse threatens the environment and wastes resources, and how recycling helps in conservation efforts.

Recycling (SOS Earth Alert), Jean F. Blashfield and Wallace B. Black, Ages 9-12, Children's Press, Chicago, 1991. Discusses advantages of recycling and how we can help protect the environment from further damage.

Waste, Recycling and Re-Use (Protecting Our Planet), Steve Parker, Ages 9-12, Raintree/Steck February 1998.

Reuse

Aunt Ippy's Museum of Junk, Rodney Alan Greenblat, Harper Collins, Inc., 1991. A brother and sister visit their ecology-minded Aunt Ippy and her world famous Museum of Junk.

The Bag Book: Over 500 Great Uses and Reuses for Paper, Plastic and Other Bags to Organize and Enhance Your Life, Vicki Lansky, Book Peddlers, September 2000.

Learn and Play the Recycle Way: Homemade Toys That Teach, Rhoda Redleaf, Audrey S. Robertson, Redleaf Press, June 1999.

Likeable Recyclables: Creative Ideas for Reusing Bags, Boxes, Cans, and Cartons, Linda Schwartz, Ages 9-12, The Learning Works, November 1992.

A Pig Tale (Aladdin Picture Books), Olivia Newton-John, Brian Seth Hurst, Ages 4-8, Aladdin Paperbacks, April 1999. A tale about a pig who is ashamed of his father because he collects junk, until one day his father makes a magnificent invention from the junk!

Social Action

50 Simple Things Kids Can do to Save the Earth (English and Spanish), Andrews and McMeel, Ed. The Earth Works Group, Revised 1999. Explains how specific things in a child's environment are connected to the rest of the world, how individual habits affect the planet, suggests environmentally sound habits and projects.

365 Ways for You and Your Children to Save the Earth One Day at a Time, Michael Viner w/ Pat Hilton, Warner Books, NY, 1991.

Acting for Nature : What Young People Around the World Are Doing to Protect the Environment, Sneed Iii Collard, Action for Nature, Ages 9-12, Heyday Books, January 2000.

Anthony Anthony's Boring Day, Dennis Reader, Doubleday & Co. Inc., 1992. Acting on his grandfather's advice, Anthony combats his boredom by taking on such environmental projects as saving the rain forests and mending the hole in the ozone layer.

Dinosaurs to the Rescue!: A Guide to Protecting Our Planet, Laurie Krasny Brown and Marc Brown, Ages 4-8, Little Brown & Co., Inc., 1994. Text and illustrations of dinosaur characters introduce the earth's major environmental problems and suggest ways children can help.

Fourth Grade Loser, Ellen Kahaner, Troll Associates, 1992. Rich kid Mike Russell's campaign to make friends in the fourth grade brings him in conflict with his father, a real estate developer, when the class decides to oppose the development of forest land near the school.

I Heard the Willow Weep, Toni Albert, Ages 4-8, Trickle Creek Books, April 2000. Teaches kids about solutions to environmental problems.

The Kid's Environment Book: What's Awry and Why, Anne Pedersen, grades 5-8, John Muir Publications, 1991. Examines environmental problems, human's historic relationship with the earth, the role of industrialization in environmental change, and what must be done to repair the damage.

A Kid's Guide to Social Action: How to Solve the Social Problems YOU CHOOSE and TurnCreative Thinking into Positive Action, Barbara A. Lewis, Free Spirit Publishing, 1991. Real stories about real kids who are making a difference at home and around the world, step-by-step guides to social action skills, tools, and ideas for getting this done. Up-to-date resource guide for social action groups, awards/recognitions for kids, etc.

The Kid's Guide to Service Projects: Over 500 Service Ideas for Young People Who Want to Make a Difference, Barbara A. Lewis, Pamela Espeland, Ages 9-12, Free Spirit Publishing, January 1995.

Pollution Problems & Solutions (Ranger Rick's Naturescope), National Wildlife Federation, Sandra Stotksy, Ages 9-12, Chelsea House Publishing, January 1999. Explains the impacts of various types of pollution on the environment and makes the connection to how kids can help protect the environment right now.

Science/Activities/Experiments

Earth Child 2000: Earth Science for Young Children: Games, Stories, Activities, and Experiments, Kathryn Sheehan and Mary Waidner, Ages 4-8, Council Oak Distribution, January 1998.

Earth-Friendly Outdoor Fun : How to MakeFabulous Games, Gardens, and Other Projectsfrom Reusable Objects (Earth-Friendly Series), George Pfiffner, Ages 9-12, John Wiley & Sons, 1996.

Earthways: Simple Environmental Activities for Young Children, Carol Petrash, Ages 4-8, Gryphon House, August 1992.

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Environmental Detective: Investigating Nature, Doug Herridge, Susan Hughes, David Suzuki (Introduction), Ages 4-8, Somerville House USA, January 1999.

A Kid's (Winter, Spring, Summer, Fall) Ecojournal: With Nature Activities for Exploring the Season, Toni Albert, Ages 9-12, Trickle Creek Books, 1997-1998. (One book for every season.) This is packed with activities that kids can do right in their own backyard.

Play Lightly on the Earth: Nature Activities for Children, Jacqueline Horsfall, Ages 9-12, Dawn Publishing, September 1997.

Janice VanCleave's Ecology for Every Kid: Easy Activities that Make Learning Science Fun, Janice Pratt VanCleave, Ages 9-12, John Wiley & Sons, 1995.

Solid Waste

Garbage Collectors (In My Neighborhood), Paulette Bourgeois, Ages 4-8, Kids Can Press, March 2000.

Garbage, Robert Maass, Ages 4-8, Henry Holt & Company, Inc., May 2000.

Garbage Creek, Valgardson, W.D., Ages 9-12, Groundwood Books, September 1998.

Grover's 10 Terrific Ways to Help Our World, Anna Ross, Random House, 1992. Grover describes ten ways to help the world, from planting trees to recycling trash. Published in conjunction with the Children's Television Network.

Pollution and Waste (Young Discoverers), Rosie Harlow, Sally Morgan (Contributor), Ages 4-8, Kingfisher Books, September 1995.

Quill's Adventures in Wasteland, Quill's Adventures in the Great Beyond, John Muir Publications, 1991. Quill Hedgehog and the Great Beyonders and their adventures with villainous alley cat Mungo Brown, who plots to destroy the countryside and exploit the land.

Trash!, Charlotte Wilcox, Ages 4-8, Carolrhoda Books, December 1988. Traces waste from home and business to transfer stations, landfills, or processing, attractive format for young readers, asks the questions how to handle it best.

Trash Attack (Garbage and What We Can Do About It), Candace Savage, Ages 9-12, Douglas & McIntyre, 1991. Attractive, readable, informative.

California Integrated Waste Management Board, http://www.ciwmb.ca.gov/Schools/Curriculum/default.htm, hosts a variety of environmental education materials available to teachers, including *Closing the Loop for K-6*, (916) 341-6765.

Environmental Education on the Internet, http://eelink.net, sponsored by the North American Environmental Education Association.

Environmental Protection Agency (EPA), http://www.epa.gov/teachers/curriculum_resources.htm, hosts a list of various environmental curriculums by subject. 1200 Pennsylvania Avenue, NW Washington, DC 20460, (202) 260-2090 or Region 10 Office (Seattle) (800) 424-4372.

http://www.epa.gov/enviroed/oeecat/, is the page for environmental education materials provided by the EPA.

Food, Land and People, http://www.foodlandpeople.org, National Office, Presidio National Park, P.O. Box 29474, San Francisco, CA 94129, (415) 561-4445.

Globe, http://www.globe.gov, Oregon Coordinator, Vicki Osis, Hatfield Marine Science Center, Extension Sea Grant Program, Oregon State University, Newport, (541) 867-0257.

Keep America Beautiful, http://www.kab.org, *Waste In Place for K-6,* 1010 Washington Boulevard, Stamford, CT 06901, (203) 323-8987.

Minnesota Office of Environmental Assistance, http://www.moea.state.mn.us/ee/index.cfm, hosts a variety of environmental education materials for teachers, including *Whata Waste for K-12*, 520 Lafayette Rd N Floor 2, St. Paul, MN 55155, 651-296-3417.

North Carolina Environmental Education Clearinghouse, http://www.ee.enr.state.nc.us, NCDENR, Office of Environmental Education, 1609 Mail Service Center, Raleigh, NC 27699, (919) 733-0711.

Project Learning Tree, http://www.plt.org/, includes the solid waste module for 6-12, Oregon Coordinator, Donald W. Wolf, College of Forestry, Oregon State University, Corvallis, (541) 737-3005.

Project Wet, http://www.montana.edu/wwwwet/, Oregon Coordinator, Sue McWilliams, The High Desert Museum, Bend, (541) 382-4754.

Project Wild, http://www.projectwild.org/, National Office, 5555 Morningside Drive, Suite 212, Houston, TX 77005 (713) 520-1936.

South Carolina Department of Health and Environmental Control, http://www.scdhec.net/eqc/, includes various environmental education materials for teachers including *Action for a cleaner tommorrow for K-8*, 2600 Bull Street, Columbia, SC 29201, (803) 896-8940.

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Selected Associations—Toxic and Household Hazardous Waste

Bio-Integral Resource Center, P.O. Box 7414, Berkeley, CA 94707, (415) 524-2567. Information clearinghouse on newest methods of less toxic pest control.

Center for Safety in the Arts (CSA), 5 Beekman St., Suite 1030, New York, NY 10038. Information clearinghouse for research and education on hazards in the visual/performing arts and school art programs.

Citizens Clearinghouse for Hazardous Waste, P.O. Box 926, Arlington, VA 22216, (703) 276-7070. Grassroots organization promoting public awareness and legislative involvement in hazardous waste issues.

Household Hazardous Waste Project, 1031 E. Battlefield, Suite 21, Springfield, MO 65807, (417) 899-5000. Develops and promotes HHW education; provides training, consultation, educational materials and a referral information service.

Waste Watch Center, Dana Duxbury and Associates, 16 Haverhill St., Andover, MA 01810 (508) 470-3044. Considered one of the leading sources for HHW management information in the country, sponsors national HHW conference, detailed bibliography of publications.

Washington Toxics Coalition, 4516 University Way NE, Seattle, WA 98105, (206) 632-1545. Provides information on effective alternatives to hazardous products.

Selected Associations—Environmental

America the Beautiful Fund (ABF), 210 Shoreham Bldg. NW, Washington DC 20005, (202) 638-1649, Paul Bruce Dowling, Exec. Dir. Offers recognition, technical support and small seed grants to individuals and community groups to initiate new local action projects to improve the quality of the environment. Presents National Recognition Awards for superior projects in the U.S.

Better World Society, 1100 17th St. NW, Washington DC 20036. Promotes public awareness of worldwide environmental issues.

Carrying Capacity Network, 1325 G St. NW, Suite 1002, Washington DC 20005-3104, (202) 879-3044, Stephen Mabley, Network Coordinator. Facilitates cooperation/sharing among activist groups, forum for development/exchange of information on carrying capacity of the earth (number of individuals resources can support with degradation of physical, ecological, cultural, and social environments).

CEIP Fund, 68 Harrison Ave., 5th Fl., Boston, MA 02111, (617) 426-4375. Provides paid full-time internships for upper-level and graduate students with private industry, government agencies and non-profit organizations in conservation services, public policy and community development, and technical services. Publishes book on careers in environmental areas.

Citizens for a Better Environment, 407 S. Dearborn, Suite 1775, Chicago, IL 60605, (312) 939-1530. Citizens concerned with environmental protection. Research, public information and education, advocacy, technical assistance to community-based organizations.

Concern, 1794 Columbia Rd. NW, Washington DC 20009, (202) 328-8160. Provides environmental information to individuals and groups and encourages community-level environmental action.

The Cousteau Society, 930 W. 21st St., Norfolk, VA 23517, (804) 627-1144. Environmental education organization dedicated to protection and improvement of quality of life for present and future generations. Conducts education, research and evaluation of man-nature interactions.

Elmwood Institute, P.O. Box 5765, Berkeley, CA 94705-0765, (415) 845-4595. Forum for research, formulation, discussion, practical application of "Ecothinking", awareness of global interdependence, ecological wisdom, etc. Intellectual resource for the Green movement, conducts workshops, seminars, etc.

Environmental Defense Fund, 257 Park Ave. S., New York, NY 10010, (212) 505-2100. Public interest organization promotes research, public education and administrative and legislative action toward the protection and improvement of environmental quality.

Friends of the Earth, 218 D St. SE, Washington DC 20003, (202) 544-2600. Lobbies congress, issues publications to further environmental goals.

Global Tomorrow Coalition, 1325 G St. NW, Washington DC 20005, (202) 628-4016. Studies global trends in population growth, use of natural resources, and the environment.

Green Seal, P.O. Box 1694, Palo Alto, CA 94302 (415) 327-2200. Developing an unbiased criteria to evaluate environmental impacts of consumer products. Evaluation will use life cycle analysis (raw material to manufacturing through consumer usage to recycling or disposal), and will publish list of products awarded "the Green Seal".

Institute for Earth Education, P.O. Box 288, Warrenville, IL 60555, (708) 393-3096. International institute of environmental educators, provides programs, consulting services, etc.

Institute for Environmental Education, 32000 Chagrin Blvd., Cleveland, OH 44124, (216) 464-1775. Seeks to improve environmental education in schools by providing information, sponsoring summer internships for teachers.

Izaak Walton League of America, 1401 Wilson Blvd., Level B. Arlington, VA 22209, (703) 528-1818. Educates the public to conserve maintain, protect and restore environment and natural resources.

Kids for a Clean Environment, P.O. Box 158254, Nashville, TN 37215, (615) 331-0708. Children's environmental organization provides information, projects for kids to make positive impact on the environment.

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League of Women Voters Education Fund, 1730 M St. NW, Washington DC 20036.

National Appropriate Technology Assistance Service, U. S. Department of Energy, P.O. Box 2525, Butte, MT 59702-2525, 1-800-428-2525. Established in 1984, NATAS helps individuals, small businesses, federal, state and local governments, non-profits and other groups implement projects that use renewable energy or energy efficiency. Provides technical engineering and commercialization assistance, referral to appropriate sources, and provides information and materials on teaching about energy in schools.

National Geographic Society, 17th and M Sts. NW, Washington DC 20036, (202) 857-7000. Scientific educational nonprofit organization supports environmental research.

Natural Resources Defense Council, 40 W. 20th St., New York, NY 10011, (212) 727-4412. Lawyers, scientists, public health specialists and planners dedicated to the wise management of natural resources through research, public education and development of public policies. Monitors regulatory agencies to ensure that public interest is considered. Produces "A kid's guide to protecting the planet" coloring and activity guide.

Rainforest Alliance, 270 Lafayette St., Suite 512, New York, NY 10012, (212) 941-1900. Encourages attitudes and actions to protect world-wide rainforests through education, public awareness, speakers' bureau, projects to involve individuals.

Ranger Rick's Nature Club, 8925 Leesburg Pike, Vienna, VA 22184, (703) 790-4000. Children's division of National Wildlife Federation, teaches young children to know and respect living things, conservation, and wise use of natural resources.

Renew America, 1400 Sixteenth Street NW Suite 710, Washington DC 20036, (202) 232-2252. Nonprofit educational organization providing national clearinghouse for successful environmental programs. Publications include Environmental Success Index (directory of over 1200 verified model programs), and a State of the States report, which ranks states according to environmental achievements.

Rocky Mountain Institute, 1739 Snowmass Creek Rd., Old Snowmass, CO 81654, (303) 927-3128. Promotes efficient and sustainable use of resources, including use of recycled building materials.

Sierra Club, 730 Polk St., San Francisco, CA 94109, (415) 776-2211. Individuals concerned with relationships between people and nature, promotes protection and conservation of natural resources through education, political action campaigns, influence public policy at all levels, schedules outings, presents awards, maintains library on environmental topics.

The Wilderness Society, 900 17th St. NW, Washington DC 20006-2596, (202) 833-2300. Works to establish the land ethic as basic element of American culture and philosophy, education on broader wilderness preservation and land protection constituency. Focuses on federal, legislative and administrative actions affecting public lands. Programs include grass roots organizing, lobbying, research and public education, presents annual awards, compiles statistics.

World Wildlife Fund, 1250 24th St. NW, Washington DC 20037, (202) 293-4800. Seeks to protect the biological resources upon which human well-being depends, emphasizes preservation of endangered wildlife, plants and habitat. Maintains library, supports projects and services of various organizations, individuals, groups, administers J. Paul Getty Wildlife Conservation Prize.

Selected Associations—Educational

Environmental Education Association of Oregon, P.O. Box 40047, Portland, OR 97240, 1-800-322-3326 or 503-725-8294. Local affiliate of the North American Environmental Education Association, sponsors teacher training, annual conference, and grants. Membership includes a subscription to Clearing magazine.

National Science Teachers Association, Publications, 1742 Connecticut Avenue NW, Washington DC 20009, 1-800-722-NSTA. Largest science teachers association in the U.S. working to improve quality of science education, publishes educational products and activity books grades K-College. Free catalog, materials for a fee. www.nsta.org

North American Association for Environmental Education, P.O. Box 400, Troy, OH 45373, 513-339-6835, Educators and interested individuals and organizations promote and coordinate environmental education programs at all levels, disseminate information, provide technical assistance, promote communication and networking regarding environmental education, presents annual awards for environmental education. www.naee.org

Northwest Association of Environmental Professionals, Three Adams Street, South Portland, ME 04106-1606. 888-251-9902. Hosts a number of educational talks and conferences in the Northwest. www.nwaep.org.

Oregon Council for the Social Studies, P.O. Box 2131, Salem, OR 97308-2131. 503-725-8566.

Oregon Science Teachers Association, Oregon affiliate of NSTA, Bernie Carlson, Executive Director, PO Box 80456, Portland, OR 97280. 503-534-9112. www.oregonscience.org

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Book: *Worms Eat My Garbage*
A definitive book on vermicomposting.

Book: *The Worm Café*
This manual describes how a teacher and her students developed a system to compost lunchroom waste with worms and save their school $6000 per year.

Game: *Wheel of Waste*
A three foot spinning "roulette" wheel with true & false questions on the subjects of composting, waste prevention, recycling and household hazardous waste. Suitable for grades 3 and up.

Video: *The Lifecycle of Paper*
Suitable for any grade.

Video: *The Lifecycle of Glass*
Suitable for any grade.

Video: *Time's A Wasting: Garbage and Recycling in Oregon*
Suitable for grades 4 and up.

Video: *Worm Bin Creatures Alive Under a Microscope*
Suitable for grades 2 and up.

To request materials call (800) 452-4011 or (503) 229-5913
or email solwaste@deq.state.or.us

For more information visit: www.deq.state.or.us/wmc/solwaste/edu.html

Factsheet

Woodsmoke Pollution

Oregon's wintertime air pollution problem

We pride ourselves on clean air, but for many communities in Oregon the clear winter skies are actually full of pollution. Smoke from wintertime residential woodburning can be so bad that it exceeds the federal health standard. It's a common myth that industry is the major contributor to air pollution, but the truth is smoke from fireplaces and woodstoves is one of the largest threats to healthful air in Oregon.

Why worry about air pollution?

Every year air pollution damages our health, our crops, our property and our environment. It degrades the livability of our communities while costing the state important jobs. In neighborhoods everywhere across Oregon, residential woodburning is a significant source of air pollution. Most wood heaters (woodstoves and fireplaces) release far more air pollution, indoors and out, than heaters using other fuels. Woodsmoke also reduces visibility.

The Department of Environmental Quality (DEQ) and your local community are asking you to help clear the air of woodsmoke. Here is information about the air pollutants in woodsmoke, their health effects, how wood burns, why it smokes and how you can produce less wood smoke. You can make a difference!

Oregon stories

The woodsmoke problem is one which affects Oregon communities both east and west of the Cascades. The communities of Medford-Ashland, Grants Pass, Eugene-Springfield, Oakridge, as well as Klamath Falls, Lakeview and La Grande all have a common threat to healthful air-woodsmoke. However, woodstoves can be a localized problem in neighborhoods in any city.

DEQ recognized long ago that woodsmoke is harmful to health, so in 1986 it began a program to rate woodstoves based on how efficiently they burn fuel, how much smoke they emit, and how much heat they put out. All new woodstoves and fireplace inserts sold in Oregon had to meet new smoke standards for particulate emissions.

What's in woodsmoke?

Oregon was the first state in the nation to certify woodstoves so consumers could make better buying decisions. It wasn't long, however, before the Environmental Protection Agency adopted these standards nationwide.

Woodsmoke is basically fuel from your firewood that doesn't burn, and becomes air pollution. Complete combustion gives off light, heat, the gas carbon dioxide, and water vapor. Smoke contains these gases and the tiny particles known as PM10. PM10 stands for "Particulate Matter less than 10 Microns in Diameter." The period at the end of this sentence is about 500 microns across. PM10s are so small that the body's natural defense mechanisms can't keep them from entering deep into the lungs where they can damage and change the structure of lung tissue, which can lead to serious respiratory problems.

PM10 particles are actually made up of very small droplets of wood tars and gases, soot, and ash. Smoke also contains the following unburned pollutant gases:

- **CO - Carbon Monoxide -** reduces the blood's ability to supply oxygen to body tissues. Even small amounts can stress your heart and reduce your ability to exercise.
- **Nox - Oxides of Nitrogen -** which may lower a child's resistance to lung infections.
- **HC - Hydrocarbons** - which can injure the lungs and makes breathing difficult.

Where does PM10 come from?

There are really only three significant sources of PM10 which occur during the winter: industry, dust from road sanding, and smoke from residential woodburning. While Oregon's industry and the Department of Transportation have worked hard over the last several years to significantly reduce PM10 pollution, people who heat with wood also have a responsibility to do the same. By far the biggest contributor to the PM10 pollution problem is woodsmoke. The reason is, so many people heat with wood.

As the price of other heating sources increased in the 1970s and 80s, so did interest in heating with wood! It is estimated that more than 340 thousand wood stoves fire up each winter in Oregon. And more than 1.5 million tons of wood is burning in Oregon homes each year. While there are some advantages to heating with wood, there are also serious problems. Pollution is one of them.

Burn smart!

Burn only "seasoned", dry fire-wood (with less than 20 percent moisture by weight). Firewood should dry a minimum of 6 to 12 months after splitting. Hardwoods dry slower than softwoods and may take more than a year to dry. To speed drying: split big logs and stack loosely in a crosswise fashion to get good air circulation. Stack a foot or more above the ground and away from building in a sunny, well-ventilated area. Cover the top to keep dew, rain and snow off the wood, but leave the sides open to breezes.

- Small is better - Build small, hot fires instead of large, smoldering ones. Open the damper wide to allow the maximum air in to allow the maximum air in to fuel the fire. Leave damper and other air inlets open for 20 to 30 minutes. It's worth the extra time to get your stove up to temperature and establish a good bed of coals before loading on any logs. Don't jam your firebox full of wood, it reduces your stove's efficiency and fuel economy. Keeping your fuel loads modest will minimize air pollution.
- No garbage! - Don't burn anything but clean, seasoned wood in your stove. No garbage, plastics, rubber, paint or oil, no painted or charcoal briquettes, and no glossy or colored paper. Burning things like that can foul your catalytic combustor, your flue, as well as cause serious health problem for you, your family and your neighbors!
- Watch those smoke signals - If you're sending up a lot of smoke, that's a sign you're burning wrong. Apart from the half hour after lighting and refueling, a properly burning fire should give off only a thin wisp of white steam. If you see smoke, adjust your dampers or air inlets to let in more air. Remember the darker the smoke, the more pollutants it contains and the more fuel is being wasted.
- Don't bed it down for the night - Not only is it a fire hazard, but when you "hold" a fire overnight by cutting down the air supply, you create a lot more smoke and creosote. You'll not only pollute the neighborhood, but the smoke can backdraft into the house, causing a very serious indoor air pollution problem. Let your fire burn out completely and rely on your home's insulation to hold in enough heat for the night.
- For safety's sake - Periodic inspection of your stove or fireplace is essential to ensure its continued safe and clean-burning operation. Certified stoves produce less creosote and provide a safer burn. Each year in Oregon there are between 1,000 and 2,000 home and chimney fires caused by woodstoves.

Professionally clean the chimney at least once a year to remove creosote buildup. Clean or replace plugged catalytic combustors according to manufacturer's instructions. Gaskets on airtight stove doors need replacement every few years. If your stove's seams are sealed with furnace cement, check for broken, missing cement.

These steps will not only reduce smoke output, but save you money! That's because proper burning techniques stretch your fuel dollar and provide more efficient heat.

New stoves mean less pollution

Did you know woodstoves that aren't certified waste up to 60 percent of the wood burned in them? No one can afford to waste valuable money on an inefficient heating system. If you own an old inefficient stove, think about replacing it with a newer, cleaner heating system. How can you tell if your stove is uncertified? Look on the back for a certification sticker from the DEQ or EPA. If there isn't one, you have an old, and potentially high polluting stove!

There is a brand new generation of home heating devices that provide good efficiency, with moderate to virtually no smoke emissions. These include natural gas stoves and furnaces, hi-tech zonal oil heaters, EPA phase II certified woodstoves and pellet stoves. Explore your options-a new system will pay for itself in fuel and cleaning savings!

Burning questions?

Look to your local air quality planning organization, or to the DEQ for answers to your questions about burning or other clean air issues. Contact numbers are below. And remember, you are your own best resource for cleaner air for our children and community!

For more information

- About woodstoves: contact the Oregon Department of Environmental Quality Woodstove Certification Program at 503-229-5177.
- On air quality issues - or for copies of this brochure, "Woodsmoke Pollution," contact DEQ's Office of Communications and Outreach at 503-229-6488
- About lung disease: contact the American Lung Association of Oregon at 503-246-1997 or 1-800-LUNG-USA

People with hearing impairments may call DEQ's TTY at 503-229-6993.

Factsheet

Burning Household Waste

Some people in Oregon still use burn barrels or burn household waste in piles. However, there are several common-sense reasons why Oregonians should choose alternative forms of household waste disposal.

Burning Household Waste Is Unhealthy

Burn barrels are inefficient and pollute because they create low temperature fires, receive little oxygen and produce a lot of smoke. Smoke from burning household waste is unhealthy to breathe, particularly for small children, pregnant women, older adults and people with asthma or other respiratory ailments.

- Many household products, such as bleached paper products and some plastics, contain chlorine. When burned, chlorine creates dioxin. Exposure to dioxin is associated with cancer and birth defects.
- Many household products, such as slick colored papers and synthetic inks, release heavy metals when burned. Human contact with heavy metals is also linked to cancer and birth defects.
- Many household products contain chemicals such as hydrochloric acid which are known to irritate the skin and eyes.

Many toxic air pollutants are produced from a burn barrel. Virtually all of the pollutants are released into the air close to ground level where they are easily inhaled.

Burning Household Waste Harms The Environment

Pollutants released when household waste is burned eventually end up back on the ground and in the water and can build up to dangerously high levels in plants, animals, and people. Health effects after exposure to these pollutants can include cancer, deformed offspring, and reproductive and immune system failure.

Alternatives To Burning Household Waste

- **Reduce** - Avoid purchasing disposable items. Buy products in bulk or economy sizes instead of in individually wrapped or in single serving sizes. Buy products that can be recharged, reused, or refilled.
- **Reuse** - Donate unwanted clothing, furniture and toys to friends, relatives or charities. Give unwanted magazines and books to hospitals or nursing homes. Mend and repair rather than discard or replace.
- **Recycle** - Separate the recyclable items, such as newspapers, glass and plastic containers and tin cans, from your residential waste and prepare them for collection or drop-off at a local recycling station.
- **Disposal** - Have your household waste picked up by a licensed waste removal company or take it to a licensed disposal facility rather than burning it.

Regulations On Burning Household Waste

State of Oregon regulations prohibit the open burning of any material that creates dense smoke or noxious odors. This includes the following materials:

- Plastics, like foam cups, meat trays and egg containers
- Tires or other rubber products
- Garbage and food waste
- Wire insulation
- Waste oil and other petroleum products
- Automobile parts, including frames
- Dead animals

In addition, burning household waste is prohibited altogether in certain areas by DEQ rules or local city and county ordinances.

Additional information on regulations regarding burning household waste in Oregon can be found in Oregon Administrative Rules, Chapter 340, Division 264. These rules are located on DEQ's web page at: www.deq.or.us/aq/rules/index.htm. For further information on Oregon's open burning rules and your city or county recycling contact person, call your local DEQ office.

	Open Burning Information	Recycling Information
NW Oregon/ Portland	503-229-5545	503-229-5529
Upper Willamette Valley & Coast	503-378-8240 x278	503-378-8240 x277
Mid-Willamette Valley & Coast	503-378-8240 x278	541-686-7838 x252
Southern Oregon Coast	541-269-2721 x22	541-776-6010
Southern Oregon	541-776-6010 x237	541-776-6010
Central Oregon	541-388-6146 x245	541-388-6146 x228
Eastern Oregon	541-278-4626	541-278-4618
Klamath Falls	541 883-5603	541 388-6146 x228

Landfill Bans in Oregon

What is banned?

It is illegal to dispose of these materials in solid waste disposal sites in Oregon:

- discarded or abandoned vehicles;
- large home or industrial appliances;
- used oil;
- tires; and
- lead-acid batteries.

The intent of this ban is to divert reusable and/or recyclable materials from Oregon's landfills, especially materials that are toxic and can harm the environment if improperly disposed of.

If your trash is picked up at the curb:

You should make separate arrangements for disposing of these materials so they aren't accidentally mixed with your garbage. Because they may have value as recyclables, check first with your garbage hauler, your local government solid waste department, or DEQ.

If you haul your own trash:

You can be held liable for disposing of any of these materials at a solid waste disposal site. You may, however, leave them for recovery or storage for recycling at a recycling depot located at a landfill or transfer station or other collection site that accepts them.

There may be better options than disposal.

In addition to the resources listed, contact DEQ for information about recycling these materials.

- vehicles and home or industrial appliances (also called "white goods," such as water heaters, refrigerators, kitchen stoves, dishwashers, washing machines and clothes dryers): scrap metal dealers, and most landfills and transfer stations, will accept these materials for their scrap value. A fee may be charged for accepting certain appliances since recyclers often need to process the appliances to remove non-recyclable or hazardous parts. Scrap metal recyclers and garbage haulers also often offer pick-up service for scrap metal. They too may charge a fee for this service.
- used oil: for information on recycling household amounts, contact your garbage hauler, transfer station, or landfill. If the oil has been mixed with solvents, paint thinner, or other liquids, it must be disposed of at a household hazardous waste collection site or event. To recycle a large quantity of oil, such as that generated by a business, look in the Yellow Pages of your telephone book under "Oils: Waste" or call DEQ.
- tires: some transfer stations and drop-off depots will accept tires for recycling, and many volume tire dealers around the state will accept used tires for a minimal fee. (Off-road tires such as earth movers and other solid tires not allowed on highways, and tires chipped to Department standards, still can be landfilled.)

If you have large quantities on your property, check with DEQ's Waste Tire Program. The program is designed to clean up tire piles before they become health and safety hazards.

- lead-acid batteries: under a law passed by the 1989 Oregon Legislature, battery retailers and wholesalers are required to accept used batteries for recycling. You can trade in as many used lead-acid batteries as you purchase from the retailer. In addition, through 1993, retailers must accept at least one lead-acid battery from you for recycling, even if you do not purchase a new battery.

Batteries also may be taken to a wholesaler, collection or recycling facility, or to a state- or EPA-permitted secondary lead smelter. Anyone who disposes of lead-acid batteries by any method other than recycling may incur a civil penalty.

If you are a disposal site operator:

The 1991 Recycling Act states that you can be held liable if you knowingly accept the materials listed above for disposal. You can, of course, continue to accept them for storage for recycling or recovery purposes. If self-haulers utilize your landfill, you may want to update signs and flyers to advise the public to separate and place these items in the recycling area, rather than in the landfill.

In addition, new municipal solid waste landfill regulations (Subtitle D) will affect all disposal site operators. The Environmental Protection Agency has issued new regulations on location, design, operation, ground water monitoring and corrective action, closure and post-closure care and financial assurance criteria. For information, please contact DEQ.

BAKER COUNTY –

Baker City Sanitary Service
Loren Henry: 541-523-2626

RECYCLING DEPOT – Get a hands-on demonstration of processing and collecting recyclables for shipment. Appropriate outdoor clothing and closed-toe shoes required. In-class slide presentations are also available. Location: 3048 Campbell St., Baker City. Hours: M-F, 8:00 – 4:30. Please call 1 week in advance. (Grades 3–5)

BENTON COUNTY –

Avery Park
Pam Wald: 541-754-0445, Ext. 204

COMPOST DEMONSTRATION SITE – View different types of composting containers on this self-guided tour in south Corvallis. Call for information.

Coffin Butte Landfill
Jim Keeney: 541-745-2018

Where does the waste go? Learn how landfills are constructed and visit a facility that converts methane gas into electricity. Daily tours except Wednesday. Appropriate outdoor clothing required. Please schedule 1 week in advance. (Grades 1-12)

Corvallis Disposal and Recycling Company
Pam Wald: 541-754-0445, Ext. 204

SOURCE RECYCLING – A waste hauling and recycling company that takes the lead in Benton County on waste reduction and recycling issues. Classroom presentations teach you how to recycle at school and home. Learn the part worms play in good compost. What is precycling? Discuss alternatives to household hazardous waste, and how to reuse items around the house. Call to schedule. (Grades K–12)

Process and Recovery Center
541-745-2018

YARD DEBRIS COMPOSTING – Hands-on facility tour. Learn about compost at its different stages. Appropriate outdoor clothing and shoes required (can be muddy). Please schedule 2 weeks in advance. (Grades 1–12)

Valley Landfills, Inc.
Jim Keeney: 541-745-2018

ENERGY RECOVERY, DISPOSAL FACILITY, YARD DEBRIS COMPOSTING – In Corvallis, Valley Landfills, Inc. owns and operates Coffin Butte Landfill and the Processing and Recovery Center. The landfill features a state-of-the-art leachate treatment plant and gas collection system that produces electrical power from landfill gas. The Processing and Recovery Center is run separately from the landfill and is a wood chipping and yard debris composting facility. Please schedule 1 week in advance. Hours of operation: 8:00 am – 5:00 pm

Western Pulp Products Company
Tom Hendrix: 541-757-1151

RECYCLING – In classroom presentations, learn how this manufacturing plant makes fiber packaging and nursery and floral containers from scrap paper and other waste materials. 1999's winner of the Corvallis Disposal-Benton County Resource Efficiency award. Please schedule at least 2 weeks in advance. (Grades K–5)

CLACKAMAS COUNTY –

Environmental Music Assemblies

ENUF!
Peter Dubois, Waste Reduction Specialist for Clark County Washington and Renee Daphne Kimball: (503) 236-4899 (Pete) or (503) 238-6973 (Renee) or email: garbage@pacifier.com

Eco-Band—(a quartet). Enviro-boogie at it's finest - whether it's for business or school, recycling events or just to have some fun!

Metro
Freda Sherburne: 503-797-1522

CLASSROOM PRESENTATIONS & FREE FIELD TRIP GUIDE – Metro's educators will come to your classroom to give presentations about recycling, waste reduction and reuse. Also available is a field trip guide to recycling and reuse facilities in Clackamas, Multnomah, and Washington counties.

CLATSOP COUNTY –

Sunset Refuse & Recycling Service
Dave Larmouth: 503-472-3176

RECYCLING FACILITY AND TRANSFER STATION – What happens after you set your garbage out at the curb? Tour a transfer and recycling facility to find out. Classroom presentations and field trips. *Free transportation provided if needed.* Hours: 10:00 am – 1:00 pm. Please schedule 2 weeks in advance. (Grades K–5)

DESCHUTES COUNTY –

Art of Construction Inc.
Paula Kinzer: 541-385-3039

REUSE & RECYCLING IN HOME CONSTRUCTION – Earthship Tour

Halfway between Bend and Redmond on Long Butte at the northwest corner of HWY 97 and Tumalo Road, you can visit a passive solar home built with reclaimed and recycled materials. Students will experience sustainable living and learn practical tips for natural gardening, saving energy, water, and resources. Please schedule 2 weeks or more in advance. (Grades 4-12)

Deschutes Refuse & Recycling Association
Paula Kinzer: 541-385-3039

Call to schedule a presentation, a school waste assessment, to find out about the Green School Program, or for recycling assistance.

WASTE REDUCTION, REUSE & RECYCLING EDUCATION – Free interactive recycling and waste prevention presentations. Program is designed to inspire students to reduce, reuse, and recycle:

Earthina

A magical character helps children discover the importance of caring for the earth.

RePlays

After a brief discussion on reuse, students create a pre-selected game or instrument from waste products.

Resource Geography

Through an interactive geography game, students learn where resources for paper and containers are extracted and how choices they make daily can improve our world.

Alternatives to Toxics

Students learn the characteristics and safe handling of toxic chemicals and make a non-toxic household cleaner.

Garbage in Perspective

Students will learn past, present, and future trends in solid waste through fun facts and figures while gaining an understanding of over-consumption.

Commingling Truck Demonstration

Children will watch a recycling truck live and in person as our driver demonstrates proper preparation and the collection process. This demonstration can accompany any presentation. (Grades K-12)

The Recycling Team
Katy Bryce: 541-388-3638

LANDFILL & RECYCLING CENTER, WASTE REDUCTION/RECYCLING EDUCATION – Tour Knott Landfill and the recycling center. See how crushed glass and composted wood waste are prepared for market. Learn where your garbage goes and all about the inner workings of a state-of-the-art landfill. Classroom presentations also available: Learn about waste reduction, reuse and recycling as well as the principles of energy and water conservation. Location: 61020 27th St., Bend. Hours: 9:00 am – 4:00 pm. Wear appropriate outdoor clothing, closed-toe shoes. Please call 1 week in advance. (Grades K–5)

DOUGLAS COUNTY -

Douglas County Landfill and Recycling Center
Terri Peterson : 541-440-4350

In this tour of an operating landfill and recycling center, learn how wood and yard wastes can be converted into marketable product, how landfill leachate is treated, and where your recyclables go. Be sure to call to schedule a classroom presentation ahead of your tour to get the most out of this experience. The 45-minute program focuses on waste reduction, reuse and recycling, along with an explanation of how landfill cells are created. Please call at least two weeks in advance. Appropriate outdoor clothing and closed-toe shoes required. Location: Exit 121 off I-5. Hours: M-F, 8:00 am to 4:00 pm. (Grades 3 and up)

Roseburg Urban Sanitary Authority
Steve Witbeck or Joe Dooley: (541) 673-6570

WASTEWATER TREATMENT FACILITY & RIVER RANGERS PROGRAM – What is a River Ranger? How can you become one? Learn in your classroom how clean water gets dirty, and what it takes to clean it up again. Environmental stewardship stressed as students learn how their daily activities contribute either to the pollution or protection of earth's limited water supply. Follow up with a tour of Roseburg's wastewater treatment plant to learn how the water you use is treated before discharge to the South Umpqua River. Appropriate outdoor clothing and flat, closed-toe shoes required. Hours: 10:00 am – 2:00 pm. Please call 1 week in advance. (Grades 4–5)

Sunrise Enterprises, Inc.
Kim Reeves: 541-673-0195

MATERIAL RECOVERY FACILITY – Learn about recycling in Douglas County. See recyclable materials being sorted, baled and prepared for market. Did you know that wood scrap can be turned into survey stakes, bridge forms and bird houses? Learn how in the tour of this facility. Appropriate outdoor clothing and flat, closed-toe shoes required. Hours: M-F, 8:00 am – 4:30 pm. Location: 1950 Mulholland Drive, Roseburg. (Grades 2–5)

HOOD RIVER COUNTY -

Columbia Gorge Organic Fruit
Ron Stewart: 541-354-1066

COMPOSTING – Learn how a working farm puts good soil biology and soil stewardship into practice as they turn food waste into compost. Tours available April – October, 8:00 am – 5:00 pm. Outdoor clothing required. Please call 3 weeks in advance. (Grades 4–5)

Hood River Recycling and Transfer Station
Erwin L. Swetnam, Jr.
District Manager, Waste Connections, Inc.: (541) 386-2272
- or -
Chery Sullivan: (360) 695-4858

RECYCLING – Tour a solid waste transfer station and see where your recycled items go! See the big trucks bring in paper, cardboard and glass to be baled and prepared for market. Appropriate outdoor clothing and closed-toe shoes required. Hours: 9:00 am – 5:00 pm, M-F. (Grades 2–5)

LANE COUNTY -

Aurora Glass Foundry
Patti Lomont: 541-681-3260

GLASS RECYCLING – See how old windowpanes and bottles are turned into art at this glass foundry located at 2345 W. Broadway in Eugene. View molten glass being poured from a cool observation deck above the foundry's "hot shop." Adult supervision required. Call 1 week in advance. Hours of operation: 9:00 am – 4:00 pm. (Grades K–5)

BRING Recycling
Sarah Grimm, Education Coordinator:
541-746-3023

RECYCLING AND WASTE REDUCTION EDUCATION FOR ADULTS AND CHILDREN –

Please book all tours and events 2 weeks in advance. Tuesday – Friday availability.

Let's Recycle!

A 20-minute interactive presentation for Kindergartners on the how-to's of recycling (Grade K)

Reduce, Reuse, Recycle Slide Show

A comprehensive presentation about how-to and why the three R's are important in Lane County (Grades 1–5)

Shop Smart for your Planet

Learn how consumer choices affect the earth's natural resources, growing landfills and the money in your pocket (Grades 3–5)

Wonderful World of Reuse

A guided activity that teaches appreciation for

Wonderful World of Reuse

A guided activity that teaches appreciation for earth's resources and the joys of creatively using them over and over again (Grades K – adult)

Worm Wonders

Learn how these lowly creatures carry out the most important part of the life cycle —compost! (Grades K–5)

Resources

Recycling Information Library open to all, lesson plans, handouts, books, videos, paper making supplies, junk art supplies, ideas and much, much more!

School Waste Audits

Call for more information.

Tours

Get up close and personal with Lane County garbage disposal and recycling sites. Appropriate outdoor clothing, closed-toe shoes required.

dePaul Building Systems
Jake Bishop: 541-521-3164

MATERIALS RECYCLING – Learn how donated scrap wood materials can be turned in to usable furniture. See a mattress factory take old beds, tears them down to the springs, bundle the stuffing for reuse, and turn out new beds! Location: 90170 Prairie Rd., Eugene. Hours: M-F, 8 am – 4:30 pm. Call 2 weeks in advance. (Grades 2–5)

Ecosort
Bruce Larson: 541-726-7552

MATERIAL RECOVERY FACILITY – Learn how Ecosort partners with Weyerhaeuser to turn waste paper into new paper. This facility demonstrates how materials in the industrial waste stream are recovered. Appropriate outdoor clothing, closed-toe shoes required. Small groups only (up to 10 with an adult). Hours: M-F, 9:00 am – 4:00 pm.

Eugene, City of
Annie Donahue: 682-5542

COMPOST DEMONSTRATION SITES
Eugene-Springfield Regional Wastewater Treatment Plant
Bob Sprick: 541-682-8617

WASTEWATER TREATMENT – Where does our wastewater go? Find out how wastewater is treated before its return to the river. Be prepared for the weather and wear closed-toe shoes during a 1.5-hour tour of this 75-acre facility (15-minute video presentation included). Physical limitations accommodated with advance notice. Tour hours: M – F, 8:00 am – 4:30 pm. Please schedule at least 2 weeks in advance. (Grades 4–5)

Genesis Juice Cooperative
Olga Jarvie: 541-344-0967

REUSE – During a tour of this Eugene juice bottling plant, learn how glass jars are reused and fruit pulp is taken to area farms to be used as compost and cattle feed. Fresh juice samples provided (or fresh fruit if preferred by parents). Closed-toe shoes required. Please schedule 1 week in advance. (Grades 3–5)

Glenwood Central Receiving Station
541-682-3828

RECYCLING – See where your garbage goes: Full line recycling, everything from scrap metal to wood. Watch commercial garbage trucks bring in loads of trash for sorting at this public recycling facility. This is a stand-alone tour, but is most often combined with a tour of the Short Mountain Landfill to give the whole picture. Outdoor clothing, closed-toe shoes required. Please call 1 week in advance.

Lane County
Jeff Bishop: 682-3828

HOUSEHOLD HAZARDOUS WASTE COLLECTION FACILITY – Outdoor clothing, closed-toe shoes required. Hours: Thursdays, 8:00 am – 1:00 pm

Lane Forest Products
Susan Posner: 541-345-9085

YARD DEBRIS COMPOSTING/WOOD RECYCLING – Take some compost back to school and see what it grows! Tour the facility at 2111 Prairie Rd., Eugene. Classroom presentations available. (Grades K–12)

Shawn Todd
Master Recycler Program: 541-344-1877

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PC Market of Choice @ 29th and Willamette
Ron Rodrigues: 541-338-8455

FOOD COMPOSTING – See how a local business reduces its food waste and learn how you can do the same at home! Award winning, in-vessel composting. (Grades 3–5)

Rexius Forest By-Products
Jack Hoeck: 541-342-1835

COMPOSTING/YARD DEBRIS & WOOD RECYCLING – Where do organic materials come from? How are they processed into compost? How is the end product marketed? Learn the answers to these questions and the science behind composting at this industrial facility. Adult supervision and appropriate outdoor clothing, closed-toe shoes required. Location: 1250 Bailey Hill Rd., Eugene. Hours of operation: 8:00 am – 5:00 pm. Spring and fall tours. Call 1 – 2 weeks in advance. (Grades 4–5)

Schnitzer Steel
David Marco: 541-686-0515

STEEL REMANUFACTURE – Find out how scrap metal is turned into new products. In-class presentations with videos are modified for age appropriateness. Hours: M-F, 8:00 am – 4:30 pm. Please schedule 2 weeks in advance. (Grades 2–5)

Short Mountain Landfill (See Glenwood Central Receiving Station, above.)
Tanya Baker: 541-682-4339

DISPOSAL FACILITY

Weyerhaeuser Recycling and paper plant
Wayne Jackson: 541-744-4102

PAPER RECYCLING – Weyerhaeuser offers in-class presentations describing their paper recycling process. Learn how to make new paper from your classroom waste paper! (Grades 3– 5)

LINN COUNTY –

Albany-Lebanon Sanitation
Pam Wald: 541-928-2554, Ext. 301

Leaders in curbside recycling. Classroom presentations teach you how to recycle at school and home. Learn the part worms play in good compost. What is precycling? Discuss alternatives to household hazardous waste, and how to reuse items around the house. Call to schedule.
(Grades K–12)

Linn County Fairgrounds: 541-926-4314

COMPOST DEMONSTRATION SITE – Self-guided tours. Call for information.

Source Recycling: 541-928-0623

In this facility tour, learn how collected recyclables are prepared for shipping to different markets. Wear appropriate outdoor clothing. Please schedule 2 weeks in advance. (Grades 2–12)

MALHEUR COUNTY –

Ontario Sanitary Service
Scott Wilson: 541-889-5719

TRANSFER STATION – See how recyclable items are delivered to a facility that separates, sorts, and bales the materials in preparation for market. Appropriate outdoor clothing and closed-toe shoes required. Hours: M-F, 8:00 am – 5:00 pm. Also available: classroom presentations teach you how to reduce, reuse and recycle in the classroom. Please call 1 week in advance. (Grades K–5)

MARION COUNTY –

Capitol Recycling & Disposal Service, Inc.
Salem, Oregon: 503-363-8890

EARTH WALK 2000 – This self-guided tour features a 1/4-mile outdoor nature trail with exceptional exhibits related to the role recycling plays in saving the environment. Fun and educational for all ages, the tour includes:

Worm Composting Spend some time at the Wriggler Ranch

Plastics Recycling Get up close and personal with a life-sized Dinosaur!

A footbridge made entirely from recycled plastic lumber

Benches to rest on made from recycled plastic lumber

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Birdhouses made from reused wood and paint from the transfer station

The tour takes about an hour (or less) and is located at Salem-Keizer Transfer Station (right across the road from the Recycling entrance) 3250 Deerpark Drive SE. Take Gaffin Rd exit off Hwy. 22 (east) just minutes past COSTCO. Open 7 days a week until 5:00 pm. Adult supervision and appropriate outdoor clothing, closed-toe shoes required.

Garten Services, Inc.
Lori McCauley: 503-581-4472 x3302

PAPER RECYCLING – Tour a recycling plant where people with disabilities work to sort paper. Educational presentations to visiting classes available. Tours and presentations scheduled the last Tuesday of each month. Call for other available times. Visitors must wear closed-toe shoes, please. Warm clothes and coats needed during cold weather months. (Grades 3 and up)

MULTNOMAH COUNTY –

Cascade Earth Force
Julie Magers, Director of Programs PSU-Center for Science Education: 503-725-8288
- or -
Bonnie Gretz: 503-725-8767

Earth Force offers programs for youth age 9 – 14 years in community action and problem solving. Through Earth Force, students discover and implement lasting solutions to environmental issues in the community. As a result, they gain life-long habits of active citizenship and environmental stewardship. Earth Force's innovative tools for educators combine the best of civic engagement, environmental education and service learning. Professional development programs for educators span the academic year. Registration begins each spring.

Children's Clean Water Festival
Julie Magers, Director of Programs PSU-Center for Science Education: 503-725-8288

ONE DAY EVENT – EVERY YEAR, FRIDAY BEFORE SPRING BREAK

Coordinated out of Portland State University's Center for Science Education, the Clean Water Festival is a one-day event for 4th – 6th graders from the greater Portland/Vancouver metropolitan areas. Students learn about water resources conservation, protection, management, and the science of water. They will also learn concrete ways to participate in the protection of water resources and about pollution prevention. PSU's Teacher's Resource Center offers curricular resources and community partners who offer services and materials for water resources education. Location: PCC – Rock Creek Campus. Fee: Approximately $120/class group. Registration: In the fall. Call for more information.

Environmental Music Assemblies

ENUF!
Peter Dubois, Waste Reduction Specialist for Clark County Washington and Renee Daphne Kimball: (503) 236-4899 (Pete) or (503) 238-6973 (Renee) or email: garbage@pacifier.com

Eco-Band—(a quartet). Enviro-boogie at it's finest - whether it's for business or school, recycling events or just to have some fun!

Epson Portland, Inc.
M. Todd Partington, Recycling Coordinator: 503-617-6763

INDUSTRIAL RECYCLING – Located in Hillsboro, Epson is a fully contained manufacturing company that produces computer peripherals. Students touring this facility and its recycling operations will learn how a manufacturing company can achieve a zero landfill rate and recycle or reuse almost everything that they manufacture. A composting collection system is being planned for Epson's two on-sight cafeterias.

Metro
Freda Sherburne: 503-797-1522

CLASSROOM PRESENTATIONS & FREE FIELD TRIP GUIDE – Metro's educators will come to your classroom to give presentations about recycling, waste reduction and reuse. Also available is a field trip guide to recycling and reuse facilities in Clackamas, Multnomah, and Washington counties. View the guide on the web at: http://www.metro-region.org/rem/wred/wred.html

TILLAMOOK COUNTY –

Cart'M
Manzanita, Oregon
Lane deMoll: 503-368-7764

FULL-SERVICE RECYCLING-REUSE-CONSTRUCTION & DEMOLITION MATERIALS AND JUNK ART CENTER – Tour this full-service recycling center/transfer station/reuse store & junk art center to see how one small community aims for "zero waste." Hours: Th–M, 10:00 am – 4:00 pm. Appropriate outdoor clothing required. Junk art workshops available, flexible arrangements. (Grades K–5)

UNION COUNTY –

City Garbage Service
Darin Larvik: 541-963-5459

LANDFILL, MATERIAL RECOVERY & BALING FACILITY + CLASSROOM PRESENTATIONS –

Classroom presentations customized to your needs...learn about the how-tos of classroom recycling and environmental stewardship. Get the full picture about where your garbage goes and what happens to it in the 6-minute video, "City Garbage Services." Hours: M-F, 8:00 am – 4:30 pm. Call 1 week in advance. (Grades 1–5)

Three tours available:

1. Tour a material recovery facility and transfer station to see recyclable materials being sorted, ground, composted and prepared for market.
2. At the baling facility, see how principal recyclable materials like newspaper, corrugated paper, and plastic milk jugs are baled in preparation to go to market.
3. Fox Hill Landfill – Learn where your garbage goes. As you watch the big trucks compact your trash, think about what might have been recycled. Learn about the cost of disposal and the history of landfills. Appropriate outdoor clothing and closed-toe shoes required.

UMATILLA COUNTY –

Pendleton Sanitary Service
Mike McHenry: 541-276-1271, Ext. 12

Tour a solid waste transfer and recycling station and compost site. Floor sorting and line recycling of paper, plastic, metal, glass, etc. Appropriate outdoor clothing required. Hours of operation: M-F, 8:00 am – 4:00 pm. Classroom presentations are available on request. Call 2 weeks in advance. (Grades K–5)

WALLOWA COUNTY –

Wallowa County Recycling Center
Dan Sherwin, Recycling Coordinator: 541-426-3332

The place to be is 619 Marr Pond Lane in Enterprise if you want to learn about recycling in Wallowa County. Watch as recyclable materials like glass, cans, cardboard, and paper are separated and prepared for market. Appropriate outdoor clothing and closed-toe shoes required. Please call 1 week in advance. Hours: M-F, 8:00 am – 4:00 pm. Landfill tours also available; call for more information.

WASCO COUNTY –

A & P Recycling
Paul Lepinski: 541-296-3056

BUY-BACK RECYCLING CENTER – See how a regional recycling depot prepares materials for mills and market. Presentation and tour focus on science and math and get students to think about how recycling saves energy and money. Outdoor clothing is required; chaperones are a must. Hours: M-F, 8:00 am – 12:00 pm. Call 2 weeks in advance. (Grades 2–5)

The Dalles Transfer Station
Jacque Betts or Linda Jones: 541-298-5149

TRANSFER STATION – Watch recyclables being separated, sorted and baled in preparation for market. Outdoor clothing required. Hours: 9:00 am – 5:00 pm, M-F. Call 1 week in advance. (Grades 1–5)

The Dalles Wastewater Treatment Plant
Kim Barte or Larry Dietrich: 541-298-1779

WASTEWATER TREATMENT PLANT – What happens to dirty water? Learn about the organisms living in wastewater by peering through a microscope in this facility's laboratory. See what it takes to treat the water before its return to the river. Appropriate outdoor clothing and closed-toe shoes required. Location: East 1st & Laughlin, The Dalles.

Hours: M-F, 9:00 am – 1:30 pm. Call 2 weeks in advance.

Wasco County Landfill
Nancy Mitchell: 541-296-4082

REGIONAL SOLID WASTE LANDFILL – Where does your garbage go? What breaks down in the environment and what doesn't? Learn the answers to these questions and many other interesting science facts on this tour of the landfill. Environmental issues discussed, and water testing explained. Great science project! Large groups take this tour in their bus; small groups can be on foot. Outdoor clothing and closed-toe shoes required. Ask about classroom presentations, too! Hours: M-Sa 9:00 am – 4:00 pm. (Grades 1–5)

Wicks Water Treatment Plant
Dave Anderson: 541-298-1242, Ext. 300

WATER TREATMENT – How can water taken from a stream be made safe enough to drink? What's the science behind water treatment? Learn about it by touring the water treatment plant and its chemical and microbiology labs. Watershed management also discussed. Outdoor clothing and closed-toe shoes required. RECOMMENDED READING: "At the Water Works" by Joanna Cole, one of the Magic School Bus series books. Hours: 7:30 am – 4:00 pm M-F. Classroom presentations are also available. (Grades 3–5)

WASHINGTON COUNTY –

Environmental Music Assemblies
ENUF!

Peter Dubois, Waste Reduction Specialist for Clark County Washington and Renee Daphne Kimball: (503) 236-4899 (Pete) or (503) 238-6973 (Renee) or email: garbage@pacifier.com

Eco-Band—(a quartet). Enviro-boogie at it's finest - whether it's for business or school, recycling events or just to have some fun!

Metro
Freda Sherburne: 503-797-1522

CLASSROOM PRESENTATIONS & FREE FIELD TRIP GUIDE – Metro's educators will come to your classroom to give presentations about recycling, waste reduction and reuse. Also available is a field trip guide to recycling and reuse facilities in Clackamas, Multnomah, and Washington counties.

YAMHILL COUNTY –

City Sanitary & Recycling Service/Yamhill Valley Material Recovery Facility
Dave Larmouth: 503-472-3176

MATERIAL RECOVERY FACILITY – Classroom presentations and tours. *Free transportation provided.*

Newberg Transfer and Recycling
Paul deBlock: 503-538-1388

TRANSFER STATION/RECYCLE CENTER – Tour a public recycling center and transfer station where corrugated material is baled. By appointment only. (Grades 1-12)

Newberg Water Treatment Plant
Howard Hamilton: 503-537-1252

WATER TREATMENT – Why is Newberg's well water RED? How is it treated so it's safe to drink? Lean the answers in this tour of Newberg's water treatment plant. Outdoor clothing required. Hours: M-F, 9:00 am – 2:00 pm. Location: 2301 Wynooski Rd., Newberg. (You have to go through SP Newsprint to get to the plant.) (Grades 1–5)

NW Greenlands
Dave Larmouth: 503-472-3176

COMPOSTING – Classroom presentations and tours. *Free transportation provided.*

RB Rubber
Paul Gilson: 503-472-4691

TIRE RECYCLING – See how chipped tires are ground and turned into playground safety products, rubber mats, truck bed liners, etc. Hours: M-F, 8:00 am – 12:00 pm. McMinnville facility. Please call early in the month and 2 weeks in advance. (Grades 2–5)

Riverbend Landfill
Michele Gullette: 503-472-8788, Ext. 29

DISPOSAL FACILITY – Tour an operating landfill and leachate lagoon. In this 40-minute tour, learn about some of the technologies used for the protection of the environment – groundwater, stormwater runoff and air. At the recycling depot, learn how principle recyclable materials are readied for market. Appropriate outdoor clothing and closed-toe shoes required. Hours: M-F, 9:00 am – 3:00 pm. Location: 13469 SW Hwy. 18, McMinnville. (Grade 5)

Water Reclamation Facility
Ron Bittler: 503-434-7412

WASTEWATER TREATMENT – Learn about removing pollutants from wastewater before it is returned to the stream. This is an advanced (tertiary) sewage treatment facility. You'll also learn about biolsolids recycling and reuse. How does your water use affect the wastewater treatment plant? Outdoor clothing required. Hours: M-F, 10:00 am – 3:00 pm.

Location: 3500 NE Clearwater Dr., McMinnville. Please call 2 weeks in advance. (Grades 4–5)

CLARK COUNTY, WASHINGTON –

Children's Clean Water Festival
Julie Magers, Director of Programs PSU-Center for Science Education: 503-725-8288

ONE DAY EVENT – EVERY YEAR, FRIDAY BEFORE SPRING BREAK

Coordinated out of Portland State University's Center for Science Education, the Clean Water Festival is a one-day event for 4th – 6th graders from the greater Portland/Vancouver metropolitan areas. Students learn about water resources conservation, protection, management, and the science of water. They will also learn concrete ways to participate in the protection of water resources and about pollution prevention. PSU's Teacher's Resource Center offers curricular resources and community partners who offer services and materials for water resources education. Location: Portland Community College – Rock Creek Campus. Fee: Approximately $120/class group. Registration: In the fall. Call for more information.

Clark County Environmental Services

CLASSROOM PRESENTATIONS – Call as directed.

MOTHER NATURE'S GARDEN PUPPET SHOW

Learn about natural gardening as you meet the heroes of the show, Sally the Gardener, Mother Nature and Sammy Salmon. There are a few villains to get in the way, of course. This musical romp was scripted and the set created by the Tears of Joy Puppet Theater. Please schedule by calling Sally Fisher at 360-397-6118 x4939 at least 1 week in advance. (Grades K–3)

STORM DRAIN STENCILING

Put water conservation into practice as you actively participate in getting the word out, "DUMP NO WASTE – DRAINS TO STREAM!" Paint, stenciling and protective wear provided. This is a dry-weather-only activity, and needs to be supervised by adults, with Clark County providing supplies. Please schedule by calling Cindy Meats at 360-397-6118 x4584 at least 1 week in advance. (All ages)

RIVER RANGERS

In this two-part classroom presentation, learn how everyday activities contribute to non-point source pollution. Part one reviews how the water cycle works. Find out how much water is available to planet earth. In part two, learn how a drop of water from the faucet in your home makes its way down the drain, through the pipes, to the wastewater treatment plant, and finally to the river. Please schedule by calling the Environmental Information Cooperative at 360-546-9510 at least 1 week in advance. (Grades 3–4)

Environmental Information Cooperative: 360-546-9510

WASTE REDUCTION, WATER CONSERVATION, AND THE ENVIRONMENT – Call to obtain your free copy of "Environmental Education Field Trips for Teachers and Educators in Clark County, Washington", a guide to some of the coolest environmental field trips to be found in Washington! Classroom presentations, service projects, teacher workshops and field trips offered. Call for more information.

Waste Connections/Columbia Resource Company
Ginger May: 360-695-4858

TRANSFER STATION – In this 1-hour tour, learn how recyclable items are prepared for remanufacture at the West Van Materials Recovery Center located at 6601 NW Old Lower River Road in Vancouver, Washington. Best group size: 20 students or less + chaperones. (Up to two groups at a time.) Outdoor clothing and closed-toe shoes required. Hours: T-Th, 10:00 am – 2:00 pm. Call 2 weeks in advance. (Grades 3–5)

Water Resources Education Center
Bev Walker: 360-696-8478

RECYCLING AND WASTE REDUCTION EDUCATION FOR ADULTS AND CHILDREN –

The City of Vancouver Water Resources Education Center offers a variety of educational programs for schools, groups, walk-in visitors, and teachers. The Center is part of the Marine Park campus, which includes the Water Reclamation Facility, 43 acres of wetlands, and a park. The Center and all of its programs are FREE to the public. Please schedule school visits 2 weeks in advance. Hours: Monday through Friday, 9 am to 2 pm. The facility can accommodate a maximum of 60 students or two classrooms per field trip with one chaperone for every five students. Special activities have been developed to help Girls and Boys Scouts obtain badge requirements. Please call for more information. To request an educational brochure, call 360/696-8478. To register for a visit: By phone: 360/696-8478; By FAX: 360/693-8878; By E-mail: bev.walker@ci.vancouver.wa.us; By mail: Water Resources Education Center, P.O. Box 1995, Vancouver WA 98668. Some of the Center's offerings include:

Exhibit Hall Tour

What fish lives in the Columbia River that is believed to have been alive when the dinosaurs roams the earth? Why is the life and death cycle of the salmon important and why are salmon so important to the environment?

Classroom Activity

Fun hands-on activities help students learn about point and non-point source pollution. Learn how your personal actions effect the environment.

Wetlands Tour

Do you know why wetlands are like a sponge? Why are some plants important to the wetlands? Are all wetlands' plants the same? Students will tour the wetlands to find the answer to these and other questions.

Water Reclamation Facility Tour

Do you know where the water goes after it goes sown the drain? What happens to it? See how the City of Vancouver cleans wastewater. (Grades 4 and above)

Note: Not all areas are wheelchair accessible.

Water Science Theater

After viewing an age-appropriate video, students will have the opportunity to participate in a question and answer activity. Students develop questions based on the video and try to "stump" their classmates.

Water Science Lab Activity

Students will try to determine where wetlands water samples were taken based on information they gather while performing tests. They will test for pH, dissolved oxygen and turbidity, and use of their own senses. (Grades 9-12)

Nature Walk

Walk along the Renaissance Trail and interact with nature. Try to identify plants and animals and learn why wetlands are important to the Columbia River.

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AOR/DEQ Waste Reduction Awareness Program (WRAP)

$$$ Awards for Schools

In partnership with the AOR, DEQ created the Waste Reduction Awareness Program (WRAP) in 1993. The program's purpose is to recognize school waste reduction & recycling programs that are permanently integrated into both school operations and classroom curricula. To promote and enhance these efforts, awards of $500.00 are presented to winners in each of four categories:

Rising Star Award

Awarded to a public or private Oregon school, K-12, giving evidence of significant progress in the development of their school's waste reduction & recycling program.

Elementary School WRAP Award

Awarded to a public or private Oregon elementary school with an outstanding waste reduction & recycling program.

Secondary School WRAP Award

Awarded to a public or private Oregon middle or high school with an outstanding waste reduction & recycling program.

Steele Gale Martin Achievement Award

Awarded to an individual or group of students who has/have made a significant contribution to waste reduction and recycling efforts in Oregon. Nominee(s) must be an individual or group under the age of 18 or be a high school senior at the time of their involvement in these activities. Nominees must also be residents of Oregon.

NOMINATIONS/APPLICATIONS

- Individual students and schools can be nominated by an AOR member, state or local government or interested businesses and their employees, or they can apply on their own behalf.
- Applications/nominations should be supported by data, program educational materials, news clippings, fact sheets, flyers, etc. The more complete the supporting documentation, the easier it is to select winners.
- Applications are due in mid-February of each year. For specific deadline information, the application form and selection criteria, and biographies and photos of past winners, visit DEQ's web site at www.deq.state.or.us/wmc/solwaste/edu or by calling (503-229-5913 or 800-452-4011. Submitted applications are reviewed in the spring by a joint AOR/DEQ panel of educators and waste reduction specialists. Winners are announced at the AOR spring education conference.

Selection Criteria: WRAP School Awards

Points will be awarded to schools for reducing the waste stream by:

- Reducing the amount of waste produced in offices, classrooms, cafeterias and landscapes
- Reusing previously used materials/switching from disposable to re-usable equipment/materials
- Recycling materials used in the school
- Educating students about waste issues in daily classroom programs

Selection Criteria: Steele Gale Martin Achievement Award

Individual students or student groups are recognized for going beyond the call of duty when it comes to waste reduction and recycling. Student criteria will include:

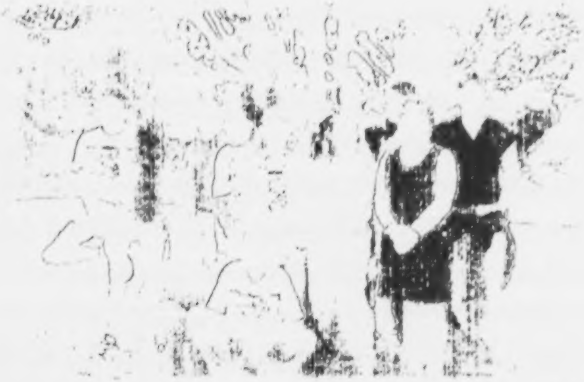
- Outstanding personal commitment to waste reduction activities.
- Personal action effecting change in school/community (institutional) waste reduction actions.
- Individual action that motivates peers/community members (individuals) to reduce waste.
- Efforts to educate others (individuals, groups, or institutions) about the importance of waste reduction and recycling.

Previous winners of Elementary or Secondary awards may not apply again for these, but MAY apply for the Steele Gale Martin Award. Previous winners of the Rising Star Award MAY apply for Elementary, Secondary, or Steele Gale Martin awards.

Applying for a WRAP award:

- Gets your school the recognition it deserves--we want to recognize and promote what you are doing to use resources efficiently.
- Helps your school become a model in your community--we'll promote your school as a model for others to follow by dedicating a section on the DEQ's Solid Waste Website to the award winners. We'll also promote your school's program to local and state print and television media.
- Shows your students that you're proud of them--they've become part of the solution by learning the sustainable behaviors you've taught them!
- Improves your school's program--by helping you assess your activities & results. Go over the questions with the kids and help them see what counts!

The following application is a sample from the 2001 WRAP judging and should be used for reference only as the committee may edit future versions. To obtain the current application, please go to DEQ's website at www.deq.state.or.us/wmc/solwaste/edu or call (503) 229-5913 or (800) 452-4011.



1999 WRAP winners: Western View Middle School
The Environmental Club accepts the award.

WRAP Application (Sample)

(Be sure to answer EVERY question for your category and attach this page to your answer sheet!)

Nominator's Name: ______________________ Phone: ______________________

Nominator's Title: ______________________

Nominated School: ______________________

Nominated Student/Group (Steele Gale Martin Award only): ______________________

School Address: ______________________ School Phone: ______________________

______________________ FAX: ______________________

Total school population (students and staff): ________ Award Category: ______________________

VOLUME OF WASTE disposed at school each week[: ______________ cubic yards.

This information is extremely important. The number you write down will probably be between 5 and 40 cubic yards per week. You will need to call your garbage hauler to find out how big your school's container is. Typically, they are 2, 4, 6, or 8 cubic yards. You will also need to find out your hauler's pickup schedule to make this calculation. For example: 4 cubic yards X 3 (pickups/week) = 12 cubic yards each week.

RISING STAR ELEMENTARY & SECONDARY SCHOOL NOMINATIONS

Involvement

1. Who coordinates your school's Waste Reduction Program? (Name of Committee/Group or Coordinator and their title)
2. Who collects recyclables within the school building?
3. How does your program encourage students and faculty to reduce, reuse and recycle? (e.g. Posters, assemblies, guest speakers, 5th graders teaching 1st graders, etc.)

Planning, Reporting & Evaluating

1. Is there a waste reduction plan in place at your school? Please describe.
2. How do you track program activities and results? If you have conducted a waste audit during the past year, please include results.

Reduce/Reuse

Describe how your school's program has impacted your purchasing practices. (Examples might include buying recycled-content products, using permanent ware and elimination of disposables, or reuse of supplies such as scrap paper, file folders, drink cups, etc.)

Recycle

List the materials you recycle at your school. (Examples might include white paper, milk cartons, newsprint, mixed-waste paper, corrugated cardboard, tinned-steel cans, aluminum cans, glass, plastics, colored paper, magazines, etc.)

Permanence

How are waste reduction principles integrated into classroom activities and the operation of the school?

Show and Tell

1. What do you believe is the most interesting or unique aspect of your program? How long has it been in place?
2. If you are the recipient of this award, how will you use the money?

STEELE GALE MARTIN NOMINATIONS

1. How did the student or group nominated for this award demonstrate commitment to waste reduction?
2. What has been the result of the nominated student's or group's efforts? (Examples might include the start of a school recycling club, the organization of a neighborhood recycling day, getting a local store to promote community recycling, etc.)
3. If you are the recipient of this award, how will you use the money?

DEQ **Oregon Green Schools Association**

Become an Oregon Green School!

The goal of the Oregon Green Schools Program is to provide schools with the information they need to set up and maintain successful waste reduction programs and to recognize schools for their waste reduction achievements.

Whether your school's waste reduction effort is just getting started or is well established, the Oregon Green Schools Recognition Program is an opportunity for your school to receive:

- Educational Support
- Resources
- Guidance
- Recognition

What Your School Receives

Green School	Certificate of Merit Green School	Premiere School
• OGSA Certificate • OGS Window Sticker • Letters of recognition sent to: Principal, School District, and School Parent Organization • Invitation to the annual OGS Summit	• OGSA Certificate of Merit Plaque • Press Release sent to local media • OGS Certificate of Merit Window Sticker • Letters of recognition sent to: Principal, School District, School Parent Organization, Local Government Representative, and Oregon Department of Environmental Quality • Invitation to the annual OGS Summit	• OGS FlagoPress Release sent to media • OGS PREMIERE Window Sticker • Letters of recognition sent to: Principal, School District, School Parent Organization, Local Government Representative, Oregon Department of Environmental Quality, and State Department of Education • Invitation to the annual OGS Summit

For more information, visit the Oregon Green Schools Association web site:
www.oregongreenschools.org
or call
503-846-8609

Oregon Recycling Awareness Week (RAW)

The first Recycling Awareness Week (RAW) celebration started in Oregon in 1986 to observe the enactment of the Opportunity to Recycle. The Act provided curbside residential recycling opportunities in cities over 4,000 population as well as drop-off depots at all Oregon disposal sites and/or more convenient locations in smaller towns and rural areas. A complete copy of the Act is available on-line at: http://www.deq.state.or.us/wmc/solwaste/links.html#statutes

To show how the opportunity to recycle had become available to Oregonians, then-Governor Victor Atiyeh took his materials to the curb in front of his Salem home--and also in front of newspaper and television reporters and camera people. Oregon industries ran newspaper ads, haulers distributed flyers to customers, and teachers attended workshops to learn about recycling. Traditionally, the Governor officially makes a proclamation about RAW every year and DEQ encourages cities and counties around the state to promote the event locally.

In the past, Recycling Awareness Week was held the first full week in October; however, the dates have been moved to the week in November that coincides with the National America Recycles Day celebration on the fifteenth. RAW spans from Saturday to Saturday to allow activities to occur on either weekend. Some communities may also participate in the national celebration, for more information visit: http://www.americarecyclesday.org/

Work with the Recycling Coordinator at your school to help plan events designed specifically for your students, faculty, staff and families. Many communities have their Mayor develop a proclamation for local Recycling Awareness Week--perhaps you should have your principal proclaim this observance for your school! Some suggested activities are listed with examples of themes that have been used in past celebrations. Themes can be modified to make them more meaningful locally. Let your students help you decide what Recycling Awareness Week activities can make your school and/or local community recycling effort better. The more students get involved, the more they will learn about the what, who, where, when, why and how of Recycling!

The themes of recycling awareness weeks past include:

Demand the Supply: Buy Recycled
Reduce Your Use
The State of Oregon Recycling
Recycle Oregon
Recycling: It's the Oregon Way
Recycling Saves
Close the Loop: Buy Recycled
Use Less Stuff
Recycling: Part of the Whole Picture
Be a Winner: Recycle
Oregonians Recycle

Recycling Awareness Week School Project Ideas

- Work with your local government recycling coordinator to do a school-community joint activity. Possibilities include developing a presentation about the importance of recycling and forming teams of students to visit local businesses to make the presentation. Students should ask businesses to sign a pledge to start an in-house recycling program for employees or look for ways to improve the things they are already doing.
- If your school's recycling program isn't already in place, there's no time like the present! See the handbook Oregon Schools Formula for Success in Waste Reduction, and contact your local government recycling coordinator or Oregon Green Schools coordinator for technical assistance. Invite your parent-teacher organization to become involved. This information is available on-line at: http://www.deq.state.or.us/wmc/solwaste/edu.html

- Use this week to implement the Rethinking Recycling curriculum activities: a lesson a day keeps the garbage away! Lessons are available on-line at: http://www.deq.state.or.us/wmc/solwaste/edu.html
- Plan a waste audit by classroom or by building. If you already have a recycling program in place, compare this year's audit with one done before you started recycling--see how effective your program really is! Try a lunch-room garbage audit daily, graph it, compare differences. (Again, ask your local government recycling coordinator or Oregon Green School coordinator for help!)
- Hold a school-wide Recycling Olympics (aka Enviro-lympics, Garbage Games, Recycling Rodeo), with events like the milk-jug shuffle (attach milk jugs to your feet and see who can run while they smash the jug), trash-ball (fill two 32 gallon cans with dry trash, dump on each side of volleyball court--object is to get all the trash to the other side (NIMBY), tin-can stilt races, can opening relay and bin-throw, sort the trash relay, trash-toss (like the hammer throw, but pick recyclable items that aren't potentially dangerous like an empty milk-jug, paper sorting bag, etc.)
- Schedule a recycle art contest and put the winning creations in a calendar, poster, advertisements or other format to remind students, teachers and staff to recycle. Don't just limit your students to two-dimensional pictures of recycling themes--encourage them to create art with recycled materials and include categories for soft sculpture, new uses for old stuff, etc. Enter school winners in DEQ's statewide recycling art contest.
- Everybody loves the movies. Recruit a theatre arts or video production class to make a recycling video for your school. This could be an MTV-style music video, a documentary, a sci-fi look at the future of recycling, a horror "what if we don't recycle" flick, or "home movies" of the recycling projects in staff and students' homes.
- Read recycling announcements every morning--choose inspirational, informational, or humorous environmental announcements including "did you know" facts, quotes from famous environmental protectors, or ideas for students or classes to make their recycling program even more effective.
- Have teachers or students write songs, poems, stories or plays about recycling and environmental issues and publish an Environmental Literature magazine. Sell it to parents to raise $$$ for your recycling program.
- Dedicate a corner of your school to a Recycling Museum (Garbage Gallery, Waste Wroom) that includes history, technology, current trends, even interactive exhibits like a trash-sorting station that provides on-the-spot feedback about recycling skills.
- Let students write and dub their own radio (TV?) Public Service Announcements--play them on your morning recycling announcements and send them out to the local media. Teach students about the importance of the media in shaping people's behavior.
- Try a Recycle Market--let everyone set up booths and sell/barter recycled items. Let the Home-Ec department do a food booth with recycled snacks ("Leftover" Pizza, Homemade ice cream with "leftover" fruit flavoring, sourdough bread items, etc.); the art department can have a heyday with recycled art (see item above), craft booths can sell recycled jewelry, a clothing booth could feature recycled jeans or patchwork skirts--this list could go on and on, but let your classroom teachers and their students take off with this idea. Let the FFA sell compost-grown fruits and vegetables and invite your local hauler or recycling groups to set up booths as well.
- Hold a recycling awareness parade. Let students dress up as recycle characters. Include a band of instruments made from recycled materials. March through the halls at school, or go big-time and arrange with your community to make it a street parade. (Work with your local government's solid waste department to get all the permits--they may even want to make it a city or county-wide event and invite recycling floats from businesses.)
- Have each classroom in your school design and produce their own recycling game and hold a school fair where students win badges (recycle stickers?) for winning. Ideas include board

games, trivia games, TV game-show type games (Concentration, Jeopardy, Wheel of Fortune, etc.), fair games (trash-dunk booth?).

- Find (or write) your own Top 40 Recycling Hits and hold a Recycled Sock Hop. Have everybody bring those leftover socks with no mates (clean, please), put them in a bin, and to get into the dance they have to pick a pair to wear. Serve recycled food treats (popsicles made from pureed fruit, punch made from leftover juices/soda, banana bread, etc.) Let students dress in recycled sock hop appropriate clothing, and give awards for the best outfits, best recycled dance steps, etc. Try karaoke for the best recycled music ever!
- Recycle all those election-year political buttons, or have students design their own button. Decopauge a used button.
- Recycle previous years' Recycling Awareness Week activities. Go through the files of teacher or school-sponsored activities and find one that hasn't been done for awhile. These kids are all new! Better yet, let the student council help you plan activities!

Activities for All Grades

- **Parade.** Organize a school or class recycling parade. Students might dress up as recyclable newspapers, cardboard, tin cans, aluminum and glass.
- **Reuse Day.** Have students wear clothing handed down from someone else and bring in materials which have been reused instead of being thrown away.
- **Field Trips.** Take your class to a local landfill, recycling center, energy recovery plant, glass manufacturing plant, paper mill, beverage bottling company, etc.
- **Science Fair Projects.** Adapt science activities from the Classroom Activity Packets and enter them in a Science Fair.
- **Logo/Slogan Contest.** Have students design their own logo or slogan about recycling.
- **Plays, Skits.** Have the class perform existing plays or write their own.
- **Recycling Relays.** Set up relays to practice preparing materials for recycling and solving recycling problems.
- **Musical Instruments.** Have students use materials from the trash to make musical instruments and use these for the parade or music activity.
- **Posters.** Have a recycling poster design contest. Solicit help from local recycling representatives, grocery stores and business. Offer a prize for the best poster and display posters in your community. Send the winners to DEQ's statewide contest.
- **Music.** Have students compose a song about garbage, landfills, recycling or reducing waste. Perform it for the school or parent-teacher organization.
- **Recycling Fair.** Hold a fair with booths explaining how to sort, prepare and store recyclables. Don't forget to include booths that promote changing buying habits and producing less waste. Arrange to use the booth at a community event.

Kids carry a message of recycling

By RANDI BJORNSTAD, *The Register-Guard*
This article appeared on June 5th, 2001 and was reprinted with permission of *The Register-Guard.*

DRAIN - Instead of parents setting a good example for their children, the kids at North Douglas Elementary School may soon begin showing their elders a thing or two about recycling.

About 100 students at the school - children in kindergarten through third grade - have been working with Drain-based educator Janai Lowenstein on a plan to conserve resources when they accompany their parents to the local grocery store.

Using a small grant from the Starseed Foundation in Sandy, Lowenstein bought stacks of un- bleached cotton tote bags and dozens of boxes of fabric crayons.

The children spent several half-hour class periods with her decorating their bags, which they will encourage their parents to use to carry groceries home when they shop at the local Hometown Foods or the PC Market of Choice in Cottage Grove.

"The markets have agreed to give the children a nickel each time they come in with their bags," Lowenstein said. "These children can become the leaders of the community in terms of recycling. If we can help them develop a sense of pride and responsibility for their world at this early age, it will help to make them better adults and parents in the future."

Although the environmental project might seem a bit far afield of the activities Lowenstein usually brings to the Drain elementary classrooms - her copyrighted Self-Help Program teaches self-control, anger management and problem-solving skills - the recycling message actually has something in common with those other topics, she said.

"Children need to feel that they are an important part of their environment and their communities - they need to understand that we need them to help change things," she said.

"We used to be a more agrarian society in which children had lots of chores and responsibilities that they don't now. They might have grumbled about them, but at least they knew they were important. This project can give them that kind of satisfaction."

Just creating the colorful, personalized bags gave the children pride in their artistry as well as teaching them about the need to conserve the Earth's resources.

On Thursday afternoon, a group of first-graders bent over their bags, decorating them with rainbows, hearts, trees, flowers and even - in the case of Jordan Derrick - an artistically drawn cat.

"These are like grocery bags - but instead of using plastic bags, we will use these," Angel Salamon said as she worked. " The plastic ones rip, but we can use these for a long time."

Charlotte Gould, who, along with her husband, Marc, owns Hometown Foods, said the use of cloth bags really could have an impact on costs and resources.

Paper grocery bags cost six cents each and plastic about four cents, so it adds to the overall cost of food if bags don't get reused, Gould said.

"I hope lots of the kids come in with their bags," she said. "It could be one of those things they do once or twice and then forget about, but I hope not." Lowenstein hopes not.

"I try to show the children that they can make choices that help the Earth and make a difference in the world," she said. "At the same time, I hope this shows adults that they need to participate, too. I hope they will look at what these children are teaching them and say, 'If a child can do this, I can do this, too.' "

The Recycling Process after Collection

At the time the Oregon Recycling Opportunity Act was passed in the 1983 legislature (ORS 459a), it was hailed as the most comprehensive statewide solid waste & recycling management system. Effective in 1986, the law resulted in most cities over 4,000 population offering curbside recycling of glass, tin, cardboard, newspaper, aluminum, scrap metal and motor oil to residents. In addition to curbside programs, "self hauling" to public landfills, transfer stations, and drop-off centers became another option, especially in rural areas where curbside programs are not economically viable.

Ever wonder what happens to your materials once they have been picked up or dropped off? Because recyclables are often placed onto garbage trucks or dropped off at the landfill, people sometimes doubt that they are really getting reprocessed rather than buried. However, the recycling industry has grown and advanced a great deal since its early roots in the 1970s. This means that the specific route for reprocessing depends on the material in question, but there are some common threads. The common factors have to do with words like collector and hauler, virgin material costs, resale markets, market distance, transportation and energy costs.

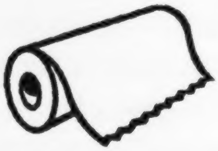
After reading about how materials are processed and recycled, hopefully you will have a better understanding of how recycling conserves natural resources, saves energy and water, reduces pollution. Moreover, you may come to see that your role as a recycler is critical in keeping unnecessary materials out of the landfill so they remain in the markets of usable products that contribute to our economy. The process of collecting and re-manufacturing recyclable materials, outlined here, is only part of recycling, however. Buying and using a recycled product completes the circle. Look for the recycled label on the products you buy, and ask your store manager to stock recycled products and products made of recycled materials.

Newspaper

What's black and white and read over and over? Recycled newspaper.

Paper that is collected for recycling is usually sold in large quantities to a paper dealer, who, because of the volume of material purchased, often operates out of a storage warehouse. The dealer then sells quantities of paper to an end user. An end user is the business where the actual recycling--manufacturing one product into a new product--takes place. To make recycled paper, mills must be concerned about both quality (cleanliness, type of paper) and quantity of the supply, therefore, they usually issue purchasing contracts to dealers rather than buying small amounts of paper from the public. This also explains why your local collector asks that paper be sorted a certain way and free from contamination such as food or paint, for example.

At the paper mill, de-inking facilities separate ink from the newspaper fibers through a chemical washing process. A slusher turns the old paper into pulp, and detergent dissolves and carries the ink away. Next, screens remove contaminants like bits of tape or dirt. The remaining pulp is mixed with additional pulp from wood chips to strengthen it and may be bleached depending on its intended use. The watery mixture is poured onto a wire, a continuously moving belt screen that allows excess moisture to drain through. By the time the mixtures gets to the end of the belt, it's solid enough to be lifted off and fed through steam-heated rollers which further dry and flatten it into a continuous sheet of paper. This paper machine produces finished newsprint at the rate of 3,000 feet per minute.



Finally the newsprint is trimmed, rolled, and sent to printing plants to be imprinted with tomorrow's news. Recycling paper requires less energy to break down the paper fibers than manufacturing wood into paper fibers. It also creates 95% less air pollution because there is less energy and chemicals needed to produce the final product.

The SP Newsprint (Newberg) and Blue Heron (Oregon City) mills are the major end-users of old newspaper in Oregon. Together they process close to 900 tons every day. This is equivalent to a stack of newspaper 9.5 miles high, and nearly 2.5 times the amount of newsprint printed and sold in this state each day. Even though Oregonians recycle nearly twice as much newspaper compared to other states (close to 70 percent), the mills must depend on old newspaper shipped to them from other states as well, in order to maintain their inventory. This is because Oregon produces about 5% of the nation's paper.

Some Oregon companies use old newspapers to make other products, too. For example, Western Pulp located in Albany, uses old newsprint for manufacturing molded flowerpots and Armstrong in St. Helens makes ceiling tiles. Additionally, Greenstone of Portland manufactures cellulose insulation, and Smurfit mills in Philomath and Sweethome make a building product called Cladwood. Paper brokers may also sell old newspaper to overseas markets. In this case, the paper sometimes is reused (rather than remanufactured) as wrapping paper.

Cardboard

What is cardboard? If you answered a brown box, you're only partly correct. There are actually two types of packaging materials made from paper. The first type is brown boxes or corrugated cardboard, also known as just corrugated. Look closely at a box and you will see that it is composed of a sandwich of linerboard (the two outer layers) and the medium (the ribbed inner layer).

The second type is the stiff gray colored packaging that your cereal and shoeboxes come in which is called "boxboard" or "grayboard". The gray color is from left over ink during the recycling process. Grayboard is not manufactured in Oregon. Grayboard should not be recycled with cardboard boxes because it contaminates the process. However, it may be included in mixed scrap paper collection, if your program collects these materials.

Notice that residents generate grayboard after the product has been used, but generally do not have large quantities of cardboard. On the other hand, businesses generate most of the cardboard waste because it used to ship and receive the products they sell. Like homeowners, stores usually have their garbage hauler or recycling service collect their cardboard 1) because it accrues in large quantities, 2) because it is a valuable material, and 3) because it would cost a lot to pay for its disposal. Once collected, it is sold to a dealer or broker, who collects and guarantees quantities of a material to end-users. In most cases, the end user is a paper mill.

At the mill, the corrugated is pulped and blended with additional pulp from wood chips. Every time old fibers are recycled, they get shorter and weaker, so they are often blended with the new pulp depending on what the final use of the paper will be. For strong boxes, the fibers need to be longer. Mills will manufacture both the linerboard and the medium, then the medium and the linerboard rolls are shipped to a box plant, where the manufacturing process is finished. The medium is corrugated or fluted by specially geared machines, the linerboards are glued on, and the resulting flat pieces, called mats, are trimmed to size and creased along a pattern of folds. The mats are shipped flat to customers who set them up into boxes.

Oregon has four major cardboard recycling plants: Weyerhaeuser in North Bend makes medium, and their Springfield plant makes linerboard; Willamette Industries in Albany makes just the linerboard. Georgia-Pacific in Toledo makes both medium and linerboard. The latter two plants also make recycled paper for brown grocery bags, also called Kraft paper.

REDUCE
REUSE
RECYCLE

Glass

The most commonly recycled types of glass are bottles and jars. Other types of glass such as Pyrex bowls, window glass, mirrors and light bulbs are made using special processes and have special physical properties. These items should not be mixed with other glass recyclables. Also, each on-route collector has a limited amount of space on the vehicle, so it isn't feasible to pick up every type of glass at the curb.

Glass bottles and jars that are empty and rinsed clean should be placed at curbside. Most recycling collectors ask people not to break the containers for safety purposes, although an on-route collector may break them with a machine to make more room in the vehicle. Likewise, at collection depots, it is generally preferred to keep glass in tact for safety reasons.

Clear glass has a higher market value than other colors, therefore, some collectors ask that you sort the glass into green, brown and clear colors. Others allow mixing of all colors and accept the lower market resale value for the materials. After the collector accumulates a quantity of a particular color or mix, they may sell it to a dealer or broker or directly to a glass plant.

At the plant, a mechanical processing system breaks the glass into small pieces called "cullet". Magnets, screens and vacuum systems separate out metals, labels, bits of plastic, metal rings and caps. The cullet then is blended in measured amounts with silica sand, soda ash, and limestone, and placed in a furnace which melts it into molten glass at a temperature of around 2500 degrees Fahrenheit. Because manufacturing virgin glass requires a temperature of about 2700 degrees, recycling glass is slightly less energy intensive.

Separated colored glass is purchased by Owens-Brockway in Portland, where it is remade into clear, green and amber bottles. A small amount of container glass also goes to Bullseye Glass, Portland, for manufacturing stained glass. Colored glass that has been mixed together goes to Strategic Materials in Portland where it is sold to out of state buyers for containers, fiberglass and road aggregate.

The Oregon Bottle Bill was enacted in 1971, making Oregon first in the nation with a statewide beverage deposit system for glass and aluminum containers. The consumer pays a deposit when the container is purchased. When it is empty, the consumer may return it to any store that carries that product, exchanging the container for a refund. This creates an incentive for people to keep deposit containers out of the trash and from littering the roadways. In fact, 90% of the Bottle Bill containers are returned for recycling.

In the past, companies offered refillable bottles that were used as much as eight or ten times before being recycled, which is a far more energy efficient method of dealing with this material than recycling alone. Unfortunately, the majority of the bottles collected today are no longer refilled before being recycled.

Tin cans

Tin is an excellent example of quality vs. quantity. Even though it's used in minute amounts, tin is essential in producing a variety of everyday items, including "tin" cans. While the cans originally were called "tinned" cans, the term was shortened to "tin" over the years. The term "tinned" is more accurate, because the cans aren't made of tin. At least not much. One ton of tin cans contain about 1,995 pounds of steel and only five pounds of tin. Yet that thin coating of tin on a steel can is essential: it helps solder the sideseam; keeps the can from rusting; and protects its contents.

Your local collector may ask you to remove the ends and flatten the cans. This allows more to be loaded into the truck, thus saving the time and fuel (and air pollution) it would take to drive the truck to the storage facility, unload it and resume collection. And since costs of shipping the cans to detinning plants also are determined by truckload, loads of compacted, flattened cans are more economical to ship.

Once collected the cans may now go through a metal dealer or directly to a detinning plant. The majority of processors in the U.S. are located in the

Midwest or in the Northeast. Once at the detinning plant, detinning solution flows around the cans (and cans with the ends removed allow more contact of the solution, which results in better recovery of the tin during the reclaiming process). In the batch process of detinning, the cans first are loaded into large perforated steel drums and dipped into a caustic chemical solution that dissolves the tin from the steel. The now detinned steel cans are drained, rinsed, and baled into 400-lb. squares. Now they are ready to be sold to steel mills and made into new products.

Meanwhile, the liquid with the tin, a salt solution called sodium stannate, is filtered to remove scraps of paper and garbage. Next, electricity is applied which makes tin form onto a plate in the solution. Finally, the tin is melted off and cast into ingots. The ingots are at least 99.98 percent pure tin and are used in the chemical and pharmaceutical industries. Pure tin also is alloyed with other metals to make solder, babbitt, pewter, and bronze products. Currently, tin is made of about 30% recycled material.

Aluminum

Did you know there are no North American sources of aluminum (bauxite) ore? The ore comes from tropical or subtropical countries such as Australia, Jamaica, and Indonesia. However, forty percent of U.S. primary aluminum production (smelting) takes place in Oregon, Washington and Montana. (Smelting turns the bauxite into the usable metal). Production and use of aluminum is higher in the U.S. than any other country.

Aluminum takes many forms because it has many uses. For example, everything from beverage cans to TV dinner trays to door frames can be molded from this flexible, lightweight metal. It's also rolled and made into foil (often inaccurately called "tinfoil"). It's all aluminum, and it's all recyclable through the process known as secondary aluminum smelting. Beverage cans alone make up 50% of all the aluminum scrap that is collected for recycling (64 billion cans were collected in 1998 in the United States). And by recycling aluminum, we save more energy over virgin production (95%), than by recycling any other type of material. And like glass, aluminum can be made from aluminum over and over again, skipping the natural resource step, which reduces pollution and helps preserve natural habitat.

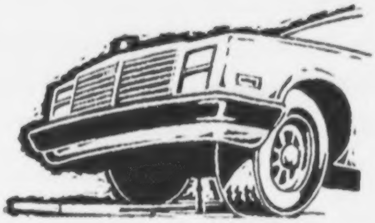
In Oregon, aluminum beer and soft drink cans are included in the Bottle Bill, and may be exchanged for deposit at the store. In fact, 90% of the Bottle Bill containers are returned for recycling. Once collected, the cans follow the same route to re-manufacturing as cans collected at curbside or swing sets collected from depots. Before being recycled, aluminum may be bought and sold several times by various recyclers or metal brokers. Its route, and whether it is sold domestically or abroad, depends on such business conditions such as cost of transportation, supply, and demand.

But eventually all aluminum reaches a producer or smelter, where it may be shredded or ground into small chips before being melted and cast into ingots. The ingots are sent on to manufacturing plants where they are rolled into sheets of aluminum and used to manufacture end products ranging from cans to castings to car bodies. The major markets for shredded aluminum are overseas end users and domestic smelters.

Nearly every large city in Oregon has several companies that collect and sell scrap metal to Schnitzer Steel Products, Acme Trading & Supply, Metro metals and Calbag Metals, the major scrap metal dealers who are located in Portland. They in turn, ship aluminum to Alcoa-Reynolds, the world's largest aluminum smelter or other secondary smelters located around the U.S.

Scrap Metal

Did you know that scrap metal has the highest recycling rate of all materials currently being recycled in the U.S.?

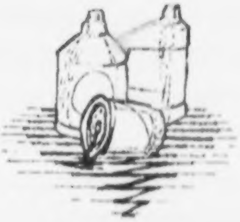


Scrap metal collection includes, steel or "tin" cans, appliances, cars, and construction materials. Although consumers have nothing to do with it, almost every car ends up being recycled eventually, as do many old appliances left at junkyards, landfills or recycling depots. Most local collection programs will accept small pieces of metal (less than 2 feet long), so don't forget to include your wire, hangars, aerosol cans, old pipes or other metals from around your house.

Because steel is by far, the most common metal that people come in contact with besides aluminum, its recycling process is highlighted in this section. Like aluminum, steel is made from iron ore, so recycling steel saves a lot of energy and conserves natural resources. However, unlike aluminum, iron ore is mined domestically in Pennsylvania, Michigan, Minnesota, and Canada, as well as globally. There are two processes for making steel. The Basic Oxygen Furnace process, which is used to produce the steel needed for packaging, car bodies, appliances and steel framing, uses a minimum of 25% recycled steel. The Electric Arc Furnace process, which is used to produce steel shapes such as railroad ties and bridge spans, uses virtually 100% recycled steel.

As with aluminum, scrap metal is purchased by a variety of brokers or recycling companies and ultimately delivered to a smelter where it is melted into ingots and cast into new metal products. There are two large smelters in Oregon, Cascade Steel Rolling Mill in McMinnville and Oregon Steel in Portland.

Motor Oil



Did you know that Oregon has the most comprehensive curbside collection program for used motor oil of any state? And putting your used motor oil at curbside or leaving it at a recycling drop-off depot makes sense, environmentally and economically. Recycling motor oil keeps it out of storm sewers, where it can pollute our waterways, and unlike virgin crude oil, re-

refined oil is a renewable resource! The process of re-refining oil uses less energy to produce a gallon of oil than the traditional method of refining crude oil. In fact, it only takes 1/3 the amount of energy to re-refine oil as compared to refining virgin oil. Recycling also ensures that it's readily available, even in times of international political crises.

Collectors ask that you place the motor oil at curbside or the depot in a clean, non-breakable bottle with a lid. That way the bottle can be transported safely and easily. After it's picked up, the collector usually takes the oil back to the shop and pours it into one of a number of tanks or drums for storage. When the drums are full of oil, an independent hauler pumps them out into a special collection truck and delivers the load to an oil processor.

The five major processors in Oregon are: Harbor Oil and Sunwest Energy, located in Portland; Industrial Oils in Klamath Falls; and Inman Oil in Vancouver, Washington. The processor must first test the oil, using standards established by the federal Environmental Protection Agency (EPA) to detect contaminates such as hazardous waste and lead. Then any water that may be mixed with the oil is eliminated, either through a settling process or by being heated and boiled off. After it is tested once again, the used oil is blended with other grades of oil. Used oil that meets EPA testing standards for flashpoint and heavy metals is called specification fuel. This type of oil is considered environmentally safe to burn in any boiler, but because of the high ash-forming components of used oil, boilers designed for easy ash removal are recommended.

One role for used oil today is to help lighten bunker fuel, the heavy residue left from virgin oil refining. Bunker fuel often is used in ships' boilers, even though it becomes thick enough to be walked on when cold. Without the lighter-weight used motor oil, bunker fuel would hardly flow through the pipes when temperatures drop. Used oil is also burned for energy in asphalt plants, cement kilns, large mills and other industrial users.

As recently as two decades ago, most used oil was re-refined into new lubricating oil for cars and trucks. Unfortunately, only a tiny fraction of the oil recycled in Oregon is resold as automotive oil, and only five percent of the oil is re-refined into oil for lubricating chain saws and machinery. However, there are some big customers helping build the demand for re-refined oil, including: Coca-Cola, UPS, US Postal Service, Frito-Lay, Cal Trans, the City of San Francisco. Mercedes Benz now puts re-refined oil in every new passenger vehicle they manufacture!

Increasing the demand seems to be working. Today, Unocal, Chevron, ARCO, Texaco and Safety-Kleen have all become involved in re-refining. Look for Unocal and Safety-Kleen's re-refined oil available in automotive stores.

Activity: Environmental Fortune Teller Instructions

Folding Instructions:

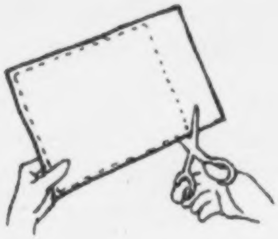
Make all folds neatly and squarely.

- A. Carefully cut along the dotted lines to make a square.
- B. With the picture of the globe facing upward, fold the paper neatly in half and then in half again.
- C. Undo the folds and flatten out the paper. Keeping the globe facing upwards, fold in each corner so the four points meet in the center.
- D. Flip the paper over. Again, fold in each corner so the four points meet in the corner.
- E. Fold the square in half, making a rectangle, with the open flaps facing down. The writing should be right-side up.
- F. Slide both index fingers and thumbs under each of the four outer flaps.
- G. Pinching your fingers together, push the top corners of the flaps toward the center. Poke down into the center to help form the shape.

To Play The Game:

1. Answer one of the questions on any of the outer flaps.
2. Choose one of the possible answers on the inside. By opening it either of two ways, four possible answers are revealed.
3. Look under the selected answer to learn more.

A



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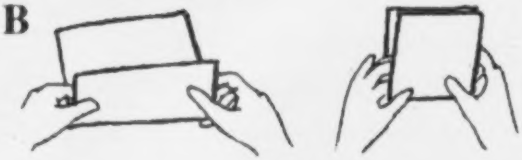

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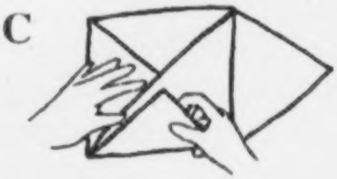

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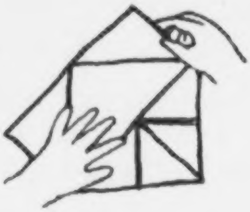

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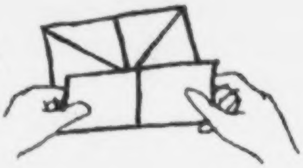

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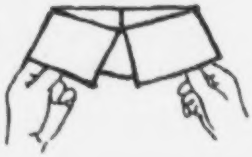

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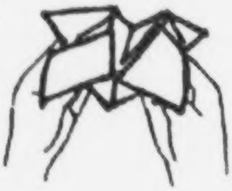
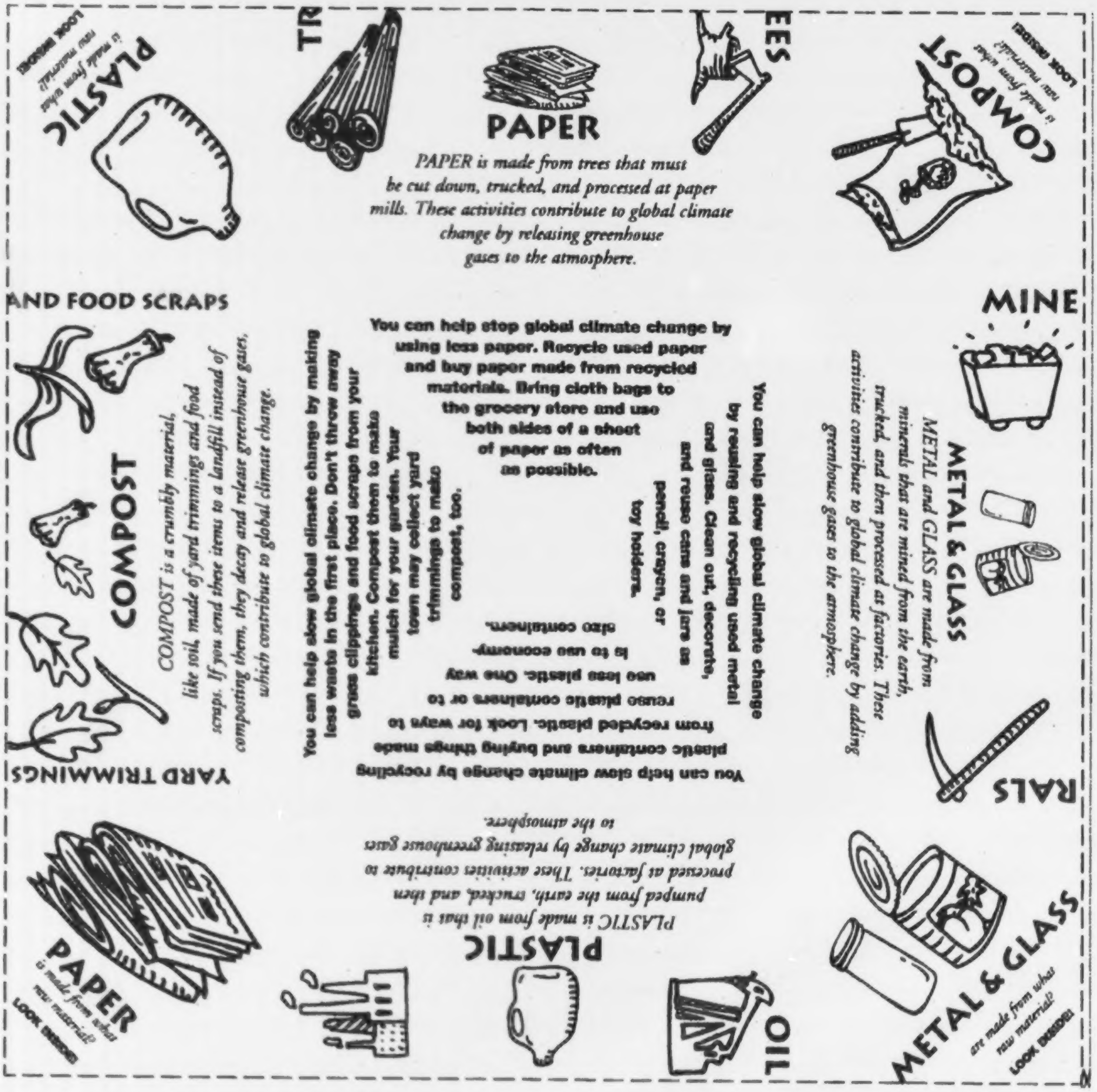


Activity: Environmental Fortune Teller


PLASTIC
is made from what raw material?
LOOK INSIDE!
TR
EES
COMPOST
is made from what raw material?
LOOK INSIDE!
MINE
RALS
METAL & GLASS
are made from what raw material?
LOOK INSIDE!
OIL
PAPER
is made from what raw material?
LOOK INSIDE!
YARD TRIMMINGS
AND FOOD SCRAPS

PAPER

PAPER is made from trees that must be cut down, trucked, and processed at paper mills. These activities contribute to global climate change by releasing greenhouse gases to the atmosphere.

You can help stop global climate change by using less paper. Recycle used paper and buy paper made from recycled materials. Bring cloth bags to the grocery store and use both sides of a sheet of paper as often as possible.

METAL & GLASS

METAL and GLASS are made from minerals that are mined from the earth, trucked, and then processed at factories. These activities contribute to global climate change by adding greenhouse gases to the atmosphere.

You can help slow global climate change by reusing and recycling used metal and glass. Clean out, decorate, and reuse cans and jars as pencil, crayon, or toy holders.

PLASTIC

PLASTIC is made from oil that is pumped from the earth, trucked, and then processed at factories. These activities contribute to global climate change by releasing greenhouse gases to the atmosphere.

You can help slow climate change by recycling plastic containers and buying things made from recycled plastic. Look for ways to reuse plastic containers or to use less plastic. One way is to use economy-size containers.

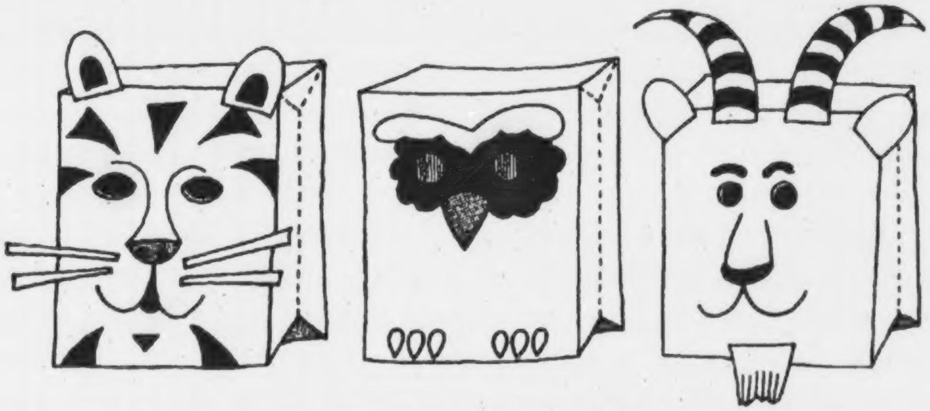
COMPOST

COMPOST is a crumbly material, like soil, made of yard trimmings and food scraps. If you send these items to a landfill instead of composting them, they decay and release greenhouse gases, which contribute to global climate change.

You can help slow global climate change by making less waste in the first place. Don't throw away grass clippings and food scraps from your kitchen. Compost them to make mulch for your garden. Your town may collect yard trimmings to make compost, too.

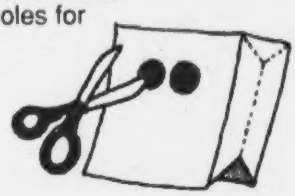
Source: U.S. Environmental Protection Agency. Office of Solid Waste. http://www.epa.gov/epaoswer/osw/k00-001.pdf (July 2000).

Activity: Let's Make An Animal Mask

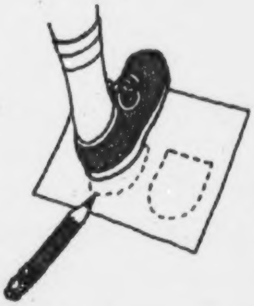


You can be a tiger, an owl, or a goat.

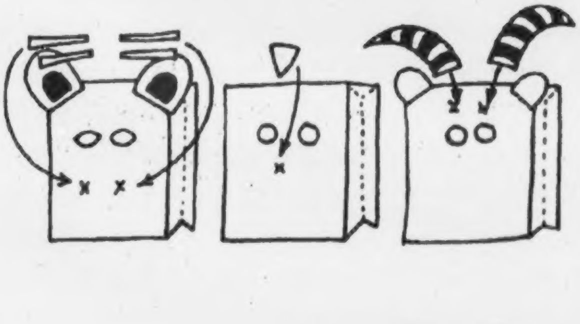
1. Open a large paper bag and cut out holes for your eyes.



2. Trace the heel of your shoe on another piece of paper to make ears. Cut these out an glue them to the bag.



3. Cut out goat horns, an owl beak, or tiger whiskers from colored paper. Glue these on.



4. Now color your mask.

Wear your mask and put on a show for your family.

Source: South Carolina Department of Health and Environmental Control: *Action for a Cleaner Tomorrow* (1996)

Extension: Hands-On Look at School Vermicomposting

Why Compost With Worms?

Worm composting is advantageous because it is a complement to regular composting. Even though you can compost food waste through regular yard debris bins, they are harder to keep free of pests than worm bins. Worm bins are built differently and keep unwanted pests (if cared for properly) out of the system. This is a great way to dispose of most food waste and, in addition to yard debris composting, will keep unwanted organic material out of the waste stream where it can create methane, a known green house gas.

Vermicomposting, better known as "worms who eat my garbage", is an exciting way to demonstrate nature's way of dealing with waste. It can also introduce students to many scientific concepts that they will need to understand in order to graduate. Whether you make this a classroom project or take on a school-wide worm program, this hands-on look at Glencoe Elementary's worm bin program will help you understand the basics.

You can visit Glencoe's web page about their project at: http://www.glencoe.pps.k12.or.us/recycling.html or call 503-916-6207. Find out more about local support for starting your program at: http://www.oregongreenschools.org. For an all inclusive reference source, you'll want to obtain a copy of Mary Apelhof's *Worms Eat My Garbage* available from Flower Press visit: www.wormwoman.com

What Do I Need To Get Started?

A. CONTAINER

In *Worms Eat My Garbage*, Mary Appelhof suggests weighing your food waste for one week (in pounds), and then provide one square foot of surface area per pound. The container depth should be between eight and twelve inches. Options to one large (and heavy) box are a number of smaller containers for easier lifting and moving and more choice of location. The book illustrates a variety of containers.

Containers can be made of scrap materials such as untreated wood or an old dresser, or you can modify a store bought rubbermaid storage container or buy a bin that is specially manufactured for worm bins. Keep in mind, however, where you will keep the worms because they cannot get too hot (over 150 degrees) or too cold (below 40 degrees). Wood tends to insulate better than metal or plastic, but you may also add a foam core insulation layer around the inside edges of the box, or loosely cover the bin with a tarp.

Worms in a 16"x19"x12" bin can process 2-3 pounds of garbage a week. Capacity of a 20" x 24" x 12" bin is up to 5 pounds of garbage a week. Depending on the size of the container, drill 8 to 12 holes (1/4 - l/2 inches) in the bottom for aeration and drainage. A plastic bin may need more drainage - if contents get too wet, drill more holes. Raise the bin on bricks or wooden blocks, and place a tray underneath to capture the excess liquid (worm tea) which can be used as liquid plant fertilizer.

REDUCE
REUSE
RECYCLE

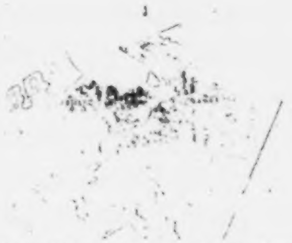
The bin needs a cover to conserve moisture and provide darkness for the worms. If the bin is indoors, a sheet of dark plastic or burlap sacking placed loosely on top of the bedding is sufficient as a cover. For outdoor bins, a solid lid is preferable, to keep out unwanted scavengers and rain. Like us, worms need air to live, so be sure to have your bin sufficiently ventilated.

Glencoe's worm bin named "Yellow Submarine" for it's yellow exterior paint, is made of wood and is located outside year round. The bin is cared for by Emma Pletz, school librarian, and her 2nd and 3rd grade helpers. The bin is insulated on the inside to help keep it warm and a plastic sheet is placed on top of the worms to keep in heat and moisture.

Yellow Submarine - Glencoe's worm bin gets fed.

B. BEDDING

It is necessary to provide a damp bedding for the worms to live in, and to bury food waste in. Suitable bedding materials are shredded newspaper and cardboard, shredded fall leaves, chopped up straw and other dead plants, seaweed, sawdust, peat moss, compost and aged manure. Try to vary the bedding in the bin as much as possible, to provide more nutrients for the worms, and to create a richer compost as shown in this picture of Glencoe's worm bin.



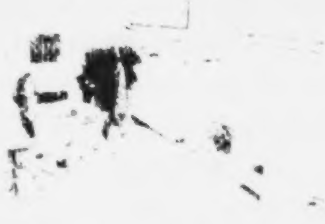
Examining the health of the worms and their bedding.

Add a couple of handfuls of sand or soil to provide necessary grit for the worm's digestion of food. It is very important to moisten the dry bedding materials before putting them in the bin, so that the overall moisture level is like a wrung-out sponge. The bin should be about three-quarters full of moistened bedding. Lift the bedding gently to create air spaces which help to control odors, and give freer movement to the worms.

C. WORMS

The two types of earthworm best suited to worm composting are the redworms: *Eisenia foetida* (commonly known as red wiggler, brandling, or manure worm) and *Lumbricus rubellus*. They are often found in aged manure and compost heaps. Please do not use dew-worms (large size worms found in soil and compost) as they are not likely to survive.

Here is a picture of Glencoe's Red Wiggler bins and the worm tea being harvested each week. The helpers carefully record the volume of the tea, then it is mixed with water in a 3 parts water to 1 part tea ratio and applied to the school's plants.



Harvesting the "worm tea."

Where To Get Your Worms?

If you feel adventurous, find a horse stable or farmer with a manure pile and collect a bagful of manure with worms. Check your own or a friend's compost bin for worms. You can also purchase worms. Check with your local plant and garden store to find out about ordering worms and use the resource list at the end of this extension.

How Many Worms Do I Need?

Mary Appelhof suggests that the correct ratio of worms to food waste should be: for one pound per day of food waste, use two pounds of worms (roughly 2000). If you are unable to get this many worms to start with, reduce the amount of food waste accordingly while the population steadily increases.

How Do I Keep my Worms Thriving?

A. FOOD

eed the
Worm

The collection bucket in Glencoe's cafeteria

You can compost food scraps such as fruit and vegetable peels, pulverized egg shells, tea bags and coffee grounds. It is advisable not to compost meats, dairy products, oily foods, and grains because worms will not readily break down these materials and it will cause problems with smells, flies, and rodents. To avoid fly and smell problems, always bury the food waste by pulling aside some of the bedding, dumping the waste, and then cover it up with the bedding again. Bury successive loads in different locations in the bin.

Glencoe collects food scraps from the students in a specially marked bucket in the cafeteria on every Friday. After lunch is over, Mrs. Pletzs and her helpers weigh the food and record the types of foods included in the mix. The food is then chopped with a flathead shovel to make it break down faster with the worms. A special marker is used to keep track of where the food was placed inside the bin the week before. The new food is added to the opposite side and the marker is moved to indicate accordingly.

Chopping the food scraps for easy worm digestion.

B. LOCATION

Worm bins can be used indoors all year round, and outdoors during the milder months. The advantage of mobile bins is that they can be moved when weather conditions change. Indoors, basements are excellent locations (warm, dark and dry), but any spare space can be utilized, so long as temperatures are between 40-80 degrees F. We know dedicated worm composters who have convenient kitchen counter worm bins. Outdoors, bins can be kept in sheds and garages, on patios and balconies, or in the yard. They should be kept out of hot sun and heavy rain.

REDUCE
REUSE
RECYCLE

C. MAINTENANCE

If you have the correct ratio of surface area to worms to food scraps, there is little to do, other than adding food, until about two and a half months have passed. By then, there should be little or no original bedding visible in the bin, and the contents will be brown and earthy looking worm castings. The contents will have substantially decreased in bulk too.

It is important to separate the worms from the finished compost, otherwise the worms will begin to die. There are several ways to do this, and you can discover which is best for you. The quickest is to simply move the finished compost over to one side of the bin, place new bedding in the space created, and put food waste in the new bedding. The worms will gradually move over and the finished compost can be skimmed off as needed.

If you have the time or want to use all the compost, you can dump the entire contents of the bin onto a large plastic sheet and separate the worms manually. Most children love to help with this process and you can turn it into a fun lesson about worms for them. Try creating small separated piles on the tarp. Shining a bright light on the area helps because worms will migrate to the bottom of each pile then you can scoop off the top compost. Watch out for the tiny, lemon-shaped worm cocoons which contain between two and twenty baby worms! By separating the worms from the compost, you save more worms for your next bin. Mix a little of the finished compost in with the new bedding of the next bin, and store the rest in plastic bags for use as required.

D. WHERE DO I USE MY COMPOST?

The compost can be mixed with potting soil and used for houseplants and patio containers. It is an excellent mulch (spread in a layer on top of the soil) for potted plants. If it is screened, it can be added for potting mixes for seedlings, and finely sprinkled on a lawn as a conditioner. It can be used directly in the garden, either dug into the soil or used as a mulch.

E. COMMON PROBLEMS AND SOLUTIONS

The most common problem is unpleasant, strong odors which are caused by lack of oxygen in the compost due to overloading with food waste so that the food sits around too long, and the bin contents become too wet. The solution is to stop adding food waste until the worms and microorganisms have broken down what food is in there, and to gently stir up the entire contents to allow more air in. Check the drainage holes to make sure they are not blocked. Drill more holes if necessary. Worms will drown if their surroundings become too wet.

Worms have been known to crawl out of the bedding and onto the sides and lid if conditions are wrong for them. If the moisture level seems all right, the bedding may be too acidic. This can happen if you add a lot of citrus peels and other acidic foods. Adjust by adding a little garden lime and cutting down on acidic wastes.

Fruit flies can be an occasional nuisance. Discourage them by always burying the food waste and not overloading. Keep a plastic sheet or piece of old carpet or sacking on the surface of the compost in the bin. If flies are still persistent, move the bin to a location where flies will not be bothersome. A few friendly spiders nearby will help control fly problems!

The Final Word

Taking worms out of their natural environment and placing them in containers creates a human responsibility. They are living creatures with their own unique needs, so it is important to create and maintain a healthy habitat for them to do their work. The first attempt to vermicompost at Glencoe was not successful, however, they did some more research and started again. If you supply the right ingredients and care, your worms will thrive and make compost for you. Happy and successful composting!

Worm Resources*

Worm & Bins for sale:
Earth Angel Worm & Garden
503-234-WORM (Portland)
888-BUY-WORM
www.buyworms.com

March Biological Control
503-554-1077 (Sherwood)

Three Trees Farm
541-942-9033 (Cottage Grove)
www.redwiggler.com

Vermico
541-476-4555 (Merlin)
www.vermico.com

Yelm Earthworm & Castings Farm
(877) 339-6767 (Washington)

Just Worms for sale:
Try your local nurseries or garden stores

Just Bins for sale:
Recycled Plastics Marketing, Inc.
800-867-3201 (Redmond, WA)
sells worm bins made of recycled plastic
www.rrpm.com

Oregon Educational Worm Resource
Edible Resource Center
Worm Digest
541-485-0456
www.wormdigest.org

Worm Data Sheet

Data Recorded by:______________

Today's Date:______________

What's the Weather Like?

____

To Do Check List:

_____Open the Bin

_____Remove Cover

_____Check for Food Remnants

_____Check for Worms

_____Prepare Food

_____Weigh Food

_____Feed the Worms

_____Cover Back On

_____Close Bin

_____Check Worm Tea

_____Secure Bin Tightly

_____Clean up

Observations

Are Worms Present? Yes No
Comments______________

Are Bugs Present? Yes No
Springtails Whiteworms Pill Bugs Millipedes
Other______________

Any Food Left Over? Yes No ______________

Odor? Yes No ______________

Compost Falling Below? Yes No ______________

Worm Tea? Yes No ______________

Need to Harvest? Yes No ______________

Feeding

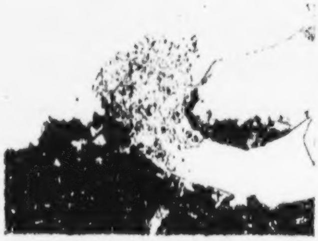
Food Volume:______________

Food Type: Apples Bananas Broccoli Carrots
Cauliflower Celery Coffee grounds Eggshells Salad

Other:______________
No Meat and No Dairy Please!
Worm Tea Volume:______________

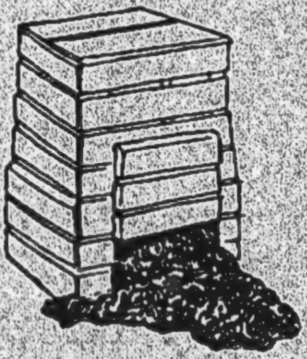
Anything Else?______________

Students at Glencoe record the worm data in their journal.



Examining the worm pile for worms and other bugs present.

Extension: Starting a Compost Pile at School



Starting a compost pile at school for yard debris is a practical way to teach students various scientific lessons--and it keeps valuable organic waste out of the landfill!

Step 1: Decide which type of composting system is right for your school. In order to compost yard waste and food scraps, you should use a container that is completely closed in order to prevent pest infestations. You can build an enclosed container, but many prefabricated models are available at lawn & garden stores that work very well.

If you are only composting yard debris, you can construct "Turning Units" which are a series of two or three 3-sided square holding bins placed side by side. The turning units can be made of wood, wire, or concrete blocks. You start with a 3 foot by 3 foot pile of organic matter and when it has reduced in size, transfer it to the next bin. The more you turn, the faster it will compost. Use the third bin for holding finished compost as it finishes in the second pile.

Step 2: Decide where to locate the bin(s) on the school property and how it will be taken care of. The pile must be checked every week to see that it has the proper moisture content and that it is turned enough to keep air in the pile.

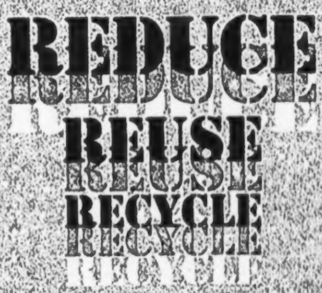
Step 3: Use the resource list in this curriculum to make sure you are up to speed on how to compost. Visit www.oregongreenschools.org and www.deq.state.or.us/wmc/solwaste/edu.html for support information.

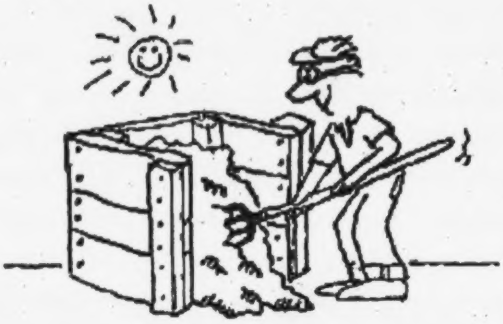
Step 4: Composting Basics: What to add to the pile
Generally, the best compost occurs with a Carbon to Nitrogen ratio of 20:1

High Carbon ingredients include:	High Nitrogen ingredients include:
Dry leaves	vegetable scraps
twigs	fresh lawn clippings
sawdust	herbivore manure
paper (tissue, napkins, newspaper,	garden weeds/leaf
coffee grounds/filters/tea bags)	clippings from shrubs
cardboard	
straw, dry grass	

What you should NEVER Add to the pile:

Meat and dairy products or fats and oils (will attract pests)
Pet Manure (non-herbivore animals)





Step 5: Keep the pile maintained. Add water until the pile is as damp as a wrung out sponge--continue watering the pile over time as it dries out. Turn the pile frequently to add air. Keep food scraps buried in the pile to keep pests away and reduce odors.

Step 6: Add new material to the top of the pile and harvest finished compost from the bottom of the pile when it is uniform, dark and crumbly and looks like soil. This may take 6 weeks to 6 months depending on the method used. *Compost should reach temperatures of 140 degrees to 160 degrees in order to kill weed seeds and plant diseases.

Step 7: Use finished compost as a soil amendment when planting (in a 2/3 soil to 1/3 compost ratio) or as a direct land application.

Problem Piles:

My pile does not heat up: The pile is too wet or too dry. Add dry material into a very wet pile. If the pile is moist, but not decomposing--then add more nitrogen rich material.

My pile is attracting pests: Turn frequently to prevent nesting animals. Use a closed container when composting food waste, keep food waste buried in the pile to keep away flies, etc. Never add meat, dairy or oily and fatty foods.

My pile smells like ammonia: The pile has too much nitrogen, so add more carbon material. Also, the pile may be too alkaline (very high pH), so add acidic material like saw dust, oak leaves, or vegetable scraps.

My pile smells like rotten eggs: The pile is becoming anaerobic--add oxygen by turning frequently and making sure that it is not too wet. If the pile is very wet, add dry brown material like leaves or dried grass.

Composting Tips:

It is not necessary to place your pile in the sun, the heat generated is caused by decomposition. It is important to try to keep the pile in a 3 foot by 3 foot size to maximize heat without compromising aeration.

Keep the pile(s) protected during the rainy season with a tarp or bin cover.

Mulch yard debris and bulky food waste (like banana peels) with a shovel or other yard chopping tool to speed the composting process. (Optional)

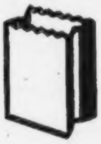
Add a few shovels of fresh soil to new compost piles to introduce the microorganisms that will break down the materials.

Extension: Creating a No-Waste Lunch Display

Follow these simple suggestions and you're on your way to an Earthwise Lunch! Ask students to practice these steps in their own lunch habits for a week or two, then bring in sample items to make a display for other students in the cafeteria.

Students at Lynch Wood Elementary, an Oregon Green School and a Waste Reduction Awareness Program (WRAP) award winner, demonstrate their school's "no-waste lunch" program.

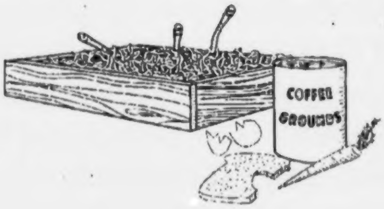
Pack your lunch
...in a colorful lunch box
...in a reusable and recyclable paper bag
...in a reusable cloth bag or lunch sack



Rinse and Reuse
...yogurt tubs for pudding, blueberries, nuts and raisins
...plastic water/pop bottles for juice, water
...locking baggies for sandwiches, veggies, cookies, chips
...aluminum foil for sandwiches, pizza, chicken
...forks and spoons (plastic or metal)

YOGURT
1 PINT

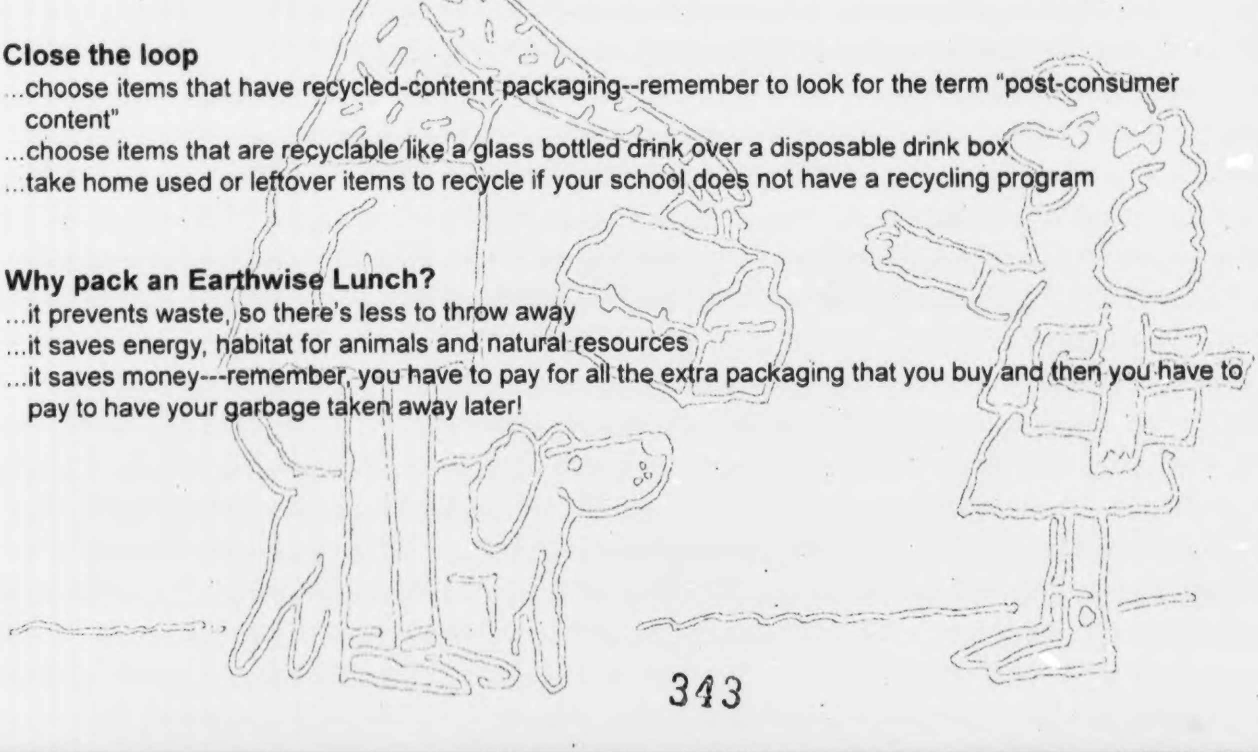
Buy in Bulk
...whenever you can, then package your individual servings into a reusable container
...bring items in their own natural packaging like oranges or bananas



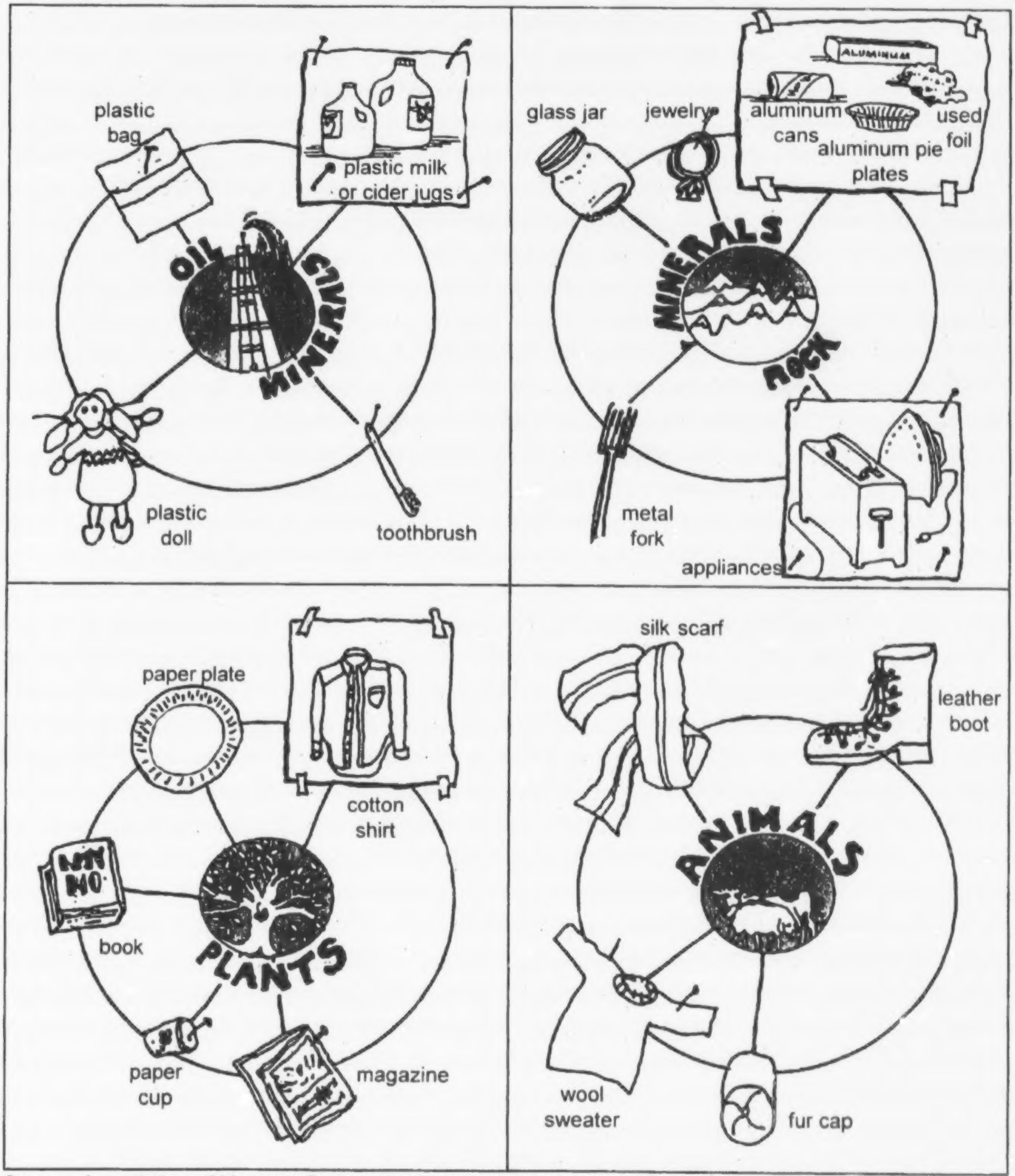
Feed the worms or compost pile
...save your vegetarian food scraps (no meat or dairy, please) for the worm or compost pile at school or home if you can

Close the loop
...choose items that have recycled-content packaging--remember to look for the term "post-consumer content"
...choose items that are recyclable like a glass bottled drink over a disposable drink box
...take home used or leftover items to recycle if your school does not have a recycling program

Why pack an Earthwise Lunch?
...it prevents waste, so there's less to throw away
...it saves energy, habitat for animals and natural resources
...it saves money---remember, you have to pay for all the extra packaging that you buy and then you have to pay to have your garbage taken away later!



Extension: Natural Resource Bulletin Board Example


plastic bag
plastic milk or cider jugs
OIL
MINERALS
plastic doll
toothbrush
glass jar
jewelry
ALUMINUM
aluminum cans
aluminum pie plates
used foil
MINERALS
ROCK
metal fork
appliances
paper plate
cotton shirt
book
PLANTS
paper cup
magazine
silk scarf
leather boot
ANIMALS
wool sweater
fur cap

Source: Association of Vermont Recyclers: *Teacher's Resource Guide for Solid Waste and Recycling Education* (1999)

Extension Lesson: Making Recycled Paper

Grade: 1-5
Subject: Writing, Art, Science, Math
Objectives:
Students will:
- explain the process of making used paper into new, usable paper
- explain the advantages to recycling paper and other materials

Teaching Time: two 40-minute class periods

Materials:
- old paper (anything but newspaper)
- blender and a wide container (pan-shaped)
- larger mixing spoons
- cups to scoop pulp onto screens
- blotters
- dishwashing detergent
- sponges or towels for soaking up water
- warm water
- a place to dry the paper
- iron (to help dry paper)
- scale
- (Optional:) spices, dried flowers, herbs, vanilla, etc.; a bathroom scale

REDUCE
REUSE
RECYCLE

Procedures:
- Use the written procedure and diagrams on to make recycled paper.

Reflection/Response:
- Ask students to describe how papermaking is done.
- Ask students to make a poster that encourages people to recycle paper.
- **What are the benefits of recycling paper rather than throwing it away?** Write the students responses on the board and add the following: (We don't have to cut down trees if we recycle, and there is less pollution created when we recycle paper. It leaves the forest so that wild animals have a place to live. We are conserving space in the landfill so that there will be a safe place to put our trash for as long as possible!)
- Have older students draw a step-by-step diagram of how the paper is made.

Extensions:
- Use the recycled paper to write and illustrate a poem.
- Use the recycled paper to make a sign that reads, "I saved a tree today."
- Collect all of the paper that would normally be thrown away for a day or a week. Weigh the amount of paper by standing on a scale. Estimate how much paper is generated weekly, monthly and annually by your class and have older students graph the results.
- Start a school recycling program, if you do not already have one, by calling your city or county officials for more information. Visit www.oregongreenschools.org for support in starting a school recycling program.
- Have a contest with another class to see who can recycle the most paper.

Oregon Common Curriculum Goal:
Arts: Create, Present, and Perform
- Apply artistic elements and technical skills to create, present, and/or perform works of art for a variety of audiences and purposes

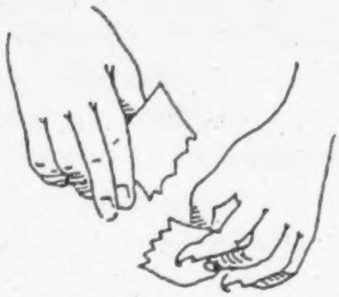
English: Writing
- Structure information in clear sequence, making connections and transitions among ideas, sentences, and paragraphs.

Grade 5 Benchmark:
- Create, present and/or perform a work of art, using experiences, imagination, observations, artistic elements and technical skills to achieve desired effect.
- Structure writing by developing a beginning, middle, and end with clear sequencing of ideas and transitions.

Extension Activity: Making Recycled Paper

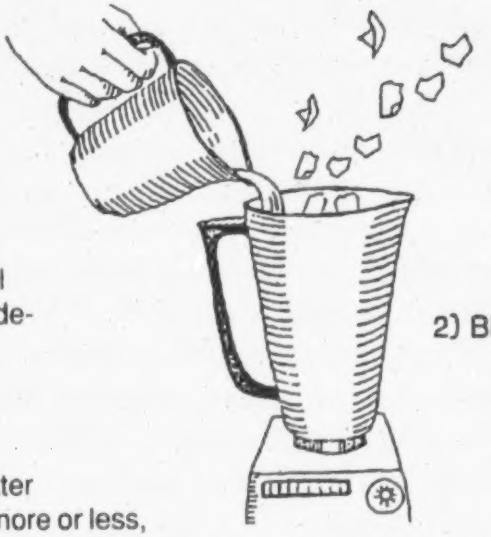
Make recycled paper by using the following procedure:

1 Tear sheets of used paper into small strips, about one-inch square. Loosely pack into blender until 1/3 to 1/2 full. Add warm water until blender is 2/3 full. It is also helpful to add a pinch or two of dryer lint, to improve the texture of the paper.



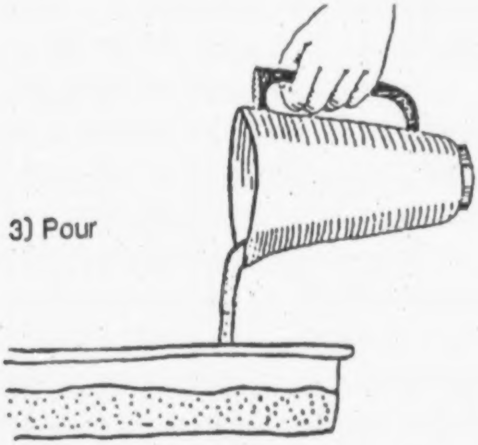
1) Rip Up

2 Blend (with lid on) until the paper looks like oatmeal mush (5-10 seconds). If you are coloring the paper by using scraps of construction paper, add them now. (If you desire white paper, add a small amount of dish washing detergent to de-ink the paper.)



2) Blend

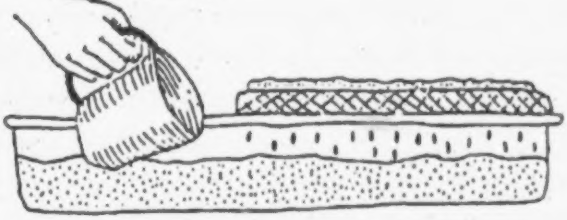
3 Pour into a pan. When pulp is mush consistency, add about 1/2 inch of water for every blender-full of pulp, adding more or less, depending on the thickness of paper desired.



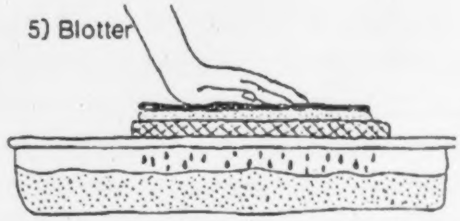
3) Pour

4 Scoop the pulp mixture evenly onto the screen with a cup (hold the frame over 1/2 of the pan). If students want to add things individually to their pulp (colors, paper bits, glitter, spices) they add it to their cupful. Let the pulp drain.

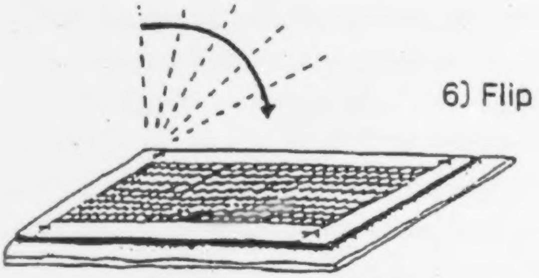
4) Scoop



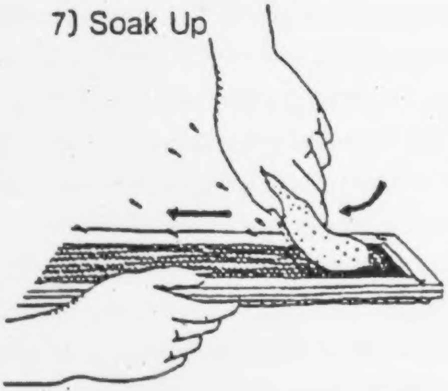
5 Place a piece of blotter over the wet sheet of paper on the screen, then flip the screen over the so the paper is between the blotter and the screen, with the screen on top.



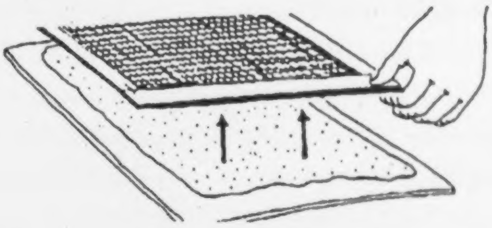
6 Soak up extra water with a sponge. This water can be squeezed out of the sponge back into the pulp mixture.



7 Lift off the screen and place the new paper in a safe place to dry. Drying takes one or two days. Exchange blotter and dry paper towels every few hours, if you want the paper to dry more quickly. The paper should not be touched or unnecessarily disturbed while drying. You may iron the paper to speed up the drying process; place a sheet of paper between the new paper and the iron.



8 For special effects, you may use cookie cutters to create unusual shapes for your paper, or you may add glitter or food coloring to the mixture.



As a recycling experiment, you can weigh the paper before placing it in the blender, then weigh the recycled paper after it dries.

- What conclusions can you make about yield from the original paper? What are the benefits of recycling paper? What are the drawbacks? Can paper be recycle indefinitely? (No, eventually the fibers break down.)

Play: The Strongest One

CHARACTERS

NARRATOR
SECOND ANT
FOURTH ANT
SUN
HOUSE
CAT
FIRE
DEER
BIG ROCK
LITTLE RED ANT
THIRD ANT
SNOW
WIND
MOUSE
STICK
WATER
ARROW

NOTE: For a large group, children can share the parts of the Second, Third, and Fourth ants. In a smaller group, one child can play several of the parts in Scent 2.

PROPS/SCENERY

Flashlights can be used for dim lighting in Scenes 1 and 2.

The Mesa in Scene 2 can be suggested with a painted backdrop.

COSTUMES

Narrator wears a loose, flowing shirt over pants, with a silver necklace and a long head scarf tied at the side.

The Ants wear red T-Shirts and red face paint. Their feelers can be suggested by securing red pipe cleaners around a child's headband.

Snow, Sun, Wind, Stick, Fire, Water, and Big Rock, all wear T-shirts decorated with their symbol. This can be drawn on paper and pinned to the T-Shirt, i.e., a Snowflake, Sun, Wind with puffing cheeks, Branch, Flame, drop of Water, Boulder. Face paint can also be used.

House carries a large paper cutout depicting an adobe.

Mouse, Cat and Deer can be suggested with face

paint, felt tails, and felt ears (or, for the Deer, pipe-cleaner antlers) secured to a child's headband.

Arrow carries a large cardboard arrow.

SCENE 1: INSIDE THE ANTS' HOLE

On a darkened stage, the ants crouch together.

NARRATOR: Little Red Ant lived in a hole under the Big rock, with all of its relatives. It often wondered about the world outside; Who in the world was the strongest one of all? One day in late spring, Little Red Ant decided to find out.

LITTLE RED ANT: I am going to find out who is the strongest. I am going to go outside and walk around.

SECOND ANT: Be careful! We Ants are very small. Something might step on you.

THIRD ANT: Yes, we are the smallest and weakest ones of all.

FOURTH ANT: Be careful, it is dangerous out there!

LITTLE RED ANT: I will be careful. I will find out who is the strongest. Maybe the strongest one can teach us how to be stronger.

SCENE 2: THE MESA

Little Red Ant walks back and forth onstage.

NARRATOR: So, Little Red Ant went outside and began to walk around. As Little Red Ant walked, the Snow began to fall.

Snow walks onto the stage.

LITTLE RED ANT: Oh, my feet are cold. This snow makes everything freeze. Snow must be the strongest. I will ask! Snow, are you the strongest of all?

SNOW: No, I am not the strongest.

LITTLE RED ANT: Who is stronger than you?

SNOW: Sun is Stronger. When Sun shines on me, I melt away. Here it comes!

As Sun walks onto the stage, Snow flops around and hurries off the stage.

LITTLE RED ANT: Ahh, Sun must be the strongest. I will ask! Sun, are you the strongest of all?

SUN: No , I am not the strongest.

LITTLE RED ANT: Who is stronger than you?

SUN: Wind is stronger. Wind blows the clouds across the sky and covers my face. Here it comes!

As Wind comes onto the stage, Sun hurries off the stage with face covered in hands.

LITTLE RED ANT: Wind must be the strongest. I will ask! Wind, are you the strongest of all?

WIND: No, I am not the strongest.

LITTLE RED ANT: Who is stronger than you?

WIND: House is stronger. When I come to House, I cannot move it. I must go around it. Here it comes!

As House walks onto the stage, Wind hurries off stage.

LITTLE RED ANT: House must be the strongest. I will ask! House, are you the strongest of all?

HOUSE: No, I am not the strongest.

LITTLE RED ANT: Who is stronger than you?

HOUSE: Mouse is stronger. Mouse comes and chews holes in me. Here it comes!

As Mouse scampers onto the stage, House lurches off the stage.

LITTLE RED ANT: Mouse must be the strongest. I will ask! Mouse, are you the strongest of all?

MOUSE: No, I am not the strongest.

LITTLE RED ANT: Who is stronger than you?

MOUSE: Cat is stronger. Cat chases me, and if Cat catches me, Cat will eat me. Here it comes!

As Cat walks on stage, Mouse hurries offstage, squeaking.

LITTLE RED ANT: Cat must be the strongest. I will ask! Cat, are you the strongest of all?

CAT: No, I am not the strongest.

LITTLE RED ANT: Who is stronger than you?

CAT: Stick is stronger. When Stick hits me, I run away. Here it comes!

As Stick walks on stage, Cat hurries offstage, meowing.

LITTLE RED ANT: Stick must be the strongest. I will ask! Stick, are you the strongest of all?

STICK: No, I am not the strongest.

LITTLE RED ANT: Who is stronger than you?

STICK: Fire is stronger. When I am put into Fire, Fire burns me up. Here it comes!

As Fire walks on stage, Stick hurries off the stage.

LITTLE RED ANT: Fire must be the strongest. I will ask! Fire, are you the strongest of all?

FIRE: No, I am not the strongest.

LITTLE RED ANT: Who is stronger than you?

FIRE: Water is stronger. When Water is poured on me, I disappear. Here it comes!

As Water walks on stage, Fire hurries offstage.

LITTLE RED ANT: Water must be the strongest. I will ask! Water, are you the strongest of all?

WATER: No, I am not the strongest.

LITTLE RED ANT: Who is stronger than you?

WATER: Deer is stronger. When Deer comes, Deer drinks me up. Here it comes!

As Deer walks on stage, Water hurries offstage.

LITTLE RED ANT: Deer must be the strongest. I will ask! Deer, are you the strongest of all?

DEER: No, I am not the strongest.

LITTLE RED ANT: Who is stronger than you?

DEER: Arrow is stronger. When Arrow strikes me, it can harm me. Here it comes!

As Arrow flies onto the stage, Deer hurries offstage, with leaping bounds.

LITTLE RED ANT: Arrow must be the strongest. I will ask! Arrow, are you the strongest of all?

ARROW: No, I am not the strongest.

LITTLE RED ANT: Who is stronger than you?

ARROW: Big Rock is stronger. I am shot from the bow, and I hit Big Rock, Big Rock breaks me.

LITTLE RED ANT: Do you mean the same Big Rock where the Red Ants live?

ARROW: Yes, that is Big Rock. Here it comes!

As Big Rock walks onto the stage, Arrow flies off stage.

LITTLE RED ANT: Big Rock must be the strongest. I will ask! Big Rock, are you the strongest of all?

BIG ROCK: No, I am not the strongest.

LITTLE RED ANT: Who is stronger than you?

BIG ROCK: You are stronger. Every day, you and the other Red Ants come and carry little pieces of me away. Someday I will be all gone…

SCENE 3: THE ANTS' HOLE

NARRATOR: So, Little Red Ant went back home and spoke to the other Ants.

The Ants crouch together on the darkened stage.

SECOND ANT: Little Red Ant has returned.

THIRD ANT: Little Red Ant has come back alive!

FOURTH ANT: Tell us about what you have learned. Who is the strongest of all?

LITTLE RED ANT: I have learned that everything is stronger than something else…

…and even though we Ants are small, in some ways, WE are the strongest of all!

THE END

Follow-up questions:

1. What is the theme or meaning of this play?
2. When Little Red Ant goes around and discovers that in some way, everyone he or she talks to can be weakened by something else, did this surprise you? What did this make you think about?
3. Can you see the relationship between all the things in this play and natural cycles like leaves falling off the tree and going back into the ground or snow thawing on the mountain and running back to the stream in the spring?
4. Can you see how animals and nature work together in a relationship called an "ecosystem"?

Teachers: help students develop an understanding of an "ecosystem" or the natural environment. The primary message is that all things are connected in one way or another, so we must try to strike a balance between our modern society, natural habitats and help maintain the environment so that we will all have a nice, healthy place to live for future generations.

Source: *Pushing up the sky: seven Native American plays for children*, Joseph Bruchac, Dial Books for Young Readers (2000).

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Play: Jobs for Bags

CHARACTERS

- Employment Person with sign, "Employment Office"

Group of protesters

- Protester 1, carrying a brown grocery bag containing a hat made from a brown paper bag
- Protester 2, carrying a brown grocery bag containing a mask made from a brown paper bag
- Protester 3, carrying a brown grocery bag containing a book cover made from a brown paper bag

The Employment Person walks out with a sign that says "Employment Office."

A group of protesters walk out; three are carrying paper bags. All are yelling, "Jobs for bags! Jobs for bags!"

Protesters circle the Employment Person and then line up on both sides.

Employment Person: "Can I help you?"

Protester 1: "We are -looking for jobs for paper bags."

Employment Person: I am sorry but we don't have any jobs for bags. "Protester 2: "'But you must have something."

Employment Person: "No, I just don't have any jobs for bags. All bags can do is hold items, and we don't have any requests for holding items. "

Protester 3: "But bags have so many other uses." All Protesters: "Yeah, bags have many uses."

Protester 1 pulls out a paper hat from a brown grocery bag and places it on his head.

Protester 1: "See, I can be a hat."

Employment Person: Well, actually we do have a job for a hat at the community garden.

Protester 2 pulls out a mask from a brown grocery bag and places it on his or her face.

Protester 2: "I can be a cool mask."

Employment Person: A mask? Yes, the community theater is looking for a mask.

Protester 3 pulls out book cover from a brown grocery bag.

Protester 3: I can be a book cover."

Employment Person (getting excited): "Great! Our local school needs book covers. They can hire at least ten of you." All protesters cheer.

Employment Person (asks the audience): "Do you know any other jobs that paper bags can do?"

The End.

This play idea comes from "As the Bag is Reused" written by teachers at the Foothill Horizons Teachers Retreat in 1997, sponsored by the San Joaquin County Office of Education and is borrowed from the California Integrated Waste Management Board's "Closing the Loop" Curriculum.

Play: The Funnels

Characters

- Maria
- Bill, a younger person
- Mark
- Bruce
- Kim
- Bob, an older person
- Kathy
- Leann
- John

Props: Two funnels

Scene I

Maria walks out carrying two funnels. She tosses them into the trashcan and sits down on a bench near the trashcan.
Maria observes.

Scene II

Bob, an older person, and **Bill**, a younger person, walk up and stand next to the trash can.
Bill says in a normal voice, "Why did the chicken cross the road on a bicycle again?"'
Bob, holding a hand up to his ear replies, "Eh, what did you say?"
Bill repeats the question louder.
Bob, holding a hand up to his ear replies, "Huh, I can't hear you."
Bill reaches into the trashcan and pulls out a funnel and hands it to Bob.
Bob puts it up to his ear.
Bill says, "Why did the chicken cross the road on a bicycle again?"
Bob replies, "I don't know. Why did the chicken cross the road on a bicycle again?"
Bill answers, "Because he wanted to RECYCLE."
The two put the funnel in the trash can and walk off laughing.
Maria laughs.

Scene III

Kathy and Mark walk out laughing and dancing. They look in the garbage can and pull out the funnels. **They each** place a funnel on their heads and begin counting down, "'Five, four, three, two, one-Happy New Year!" **Then they** take the funnels off their heads and turn them over and yell through them, "Happy New Year!" **They put** the funnels in the trashcan and walk off.
Maria smiles.

Scene IV

Leann and Bruce walk out. Bruce is coughing. Leann reaches into the trashcan and pulls out a funnel. **Leann** says, "You really need to take your medicine." **Then Leann** holds the funnel up to Bruce's mouth and pretends to pour medicine into it.
Bruce says, "Wow, my cough is gone. Thank you, Leann."
Leann says, "'You are welcome."'
They put the funnel back in the trashcan and walk off.
Maria is watching closely.

Scene V

John and Kim walk up and pick up the funnels. **John** holds the pointed ends up to his eyes like binoculars and looks all around as if looking at birds. He hands the funnels to Kim, who looks through them. **Kim** then places the funnels back in the trashcan. Both walk off.

Maria then stands up and walks over to pick up the funnels. She looks them over and says, "Wow, these have so many uses. I didn't need to throw them away!" She walks off admiring the funnels.

The End.

The original script for "The Funnels" was written by teachers at the Foot-hill Horizons Teachers Retreat on April 18, 1997, sponsored by the San Joaquin Office of Education. This is an edited version that was borrowed from the California Integrated Waste Management Board's "Closing the Loop: Exploring Integrated Waste Management and Resource Conservation" curriculum.

Play: Rocky's Not-So-Fun Adventures

Rebecca: Hi Rocky! How are you?

Rocky: Funny you should ask. I had to go to the hospital last week. My stomach still doesn't feel very good.

Rebecca: Too much candy again, Rocky?

Rocky: Not exactly. I was having a good time playing house and I ate something that I found under the kitchen sink. It looked like something my Mom spreads on crackers at her parties… but it made me very sick, so the doctor makes me eat special foods until I feel better. At the hospital, they told me that there are lots of things in my house which are poisonous, toxic, hazardous, and dangerous to eat, smell, and touch.

Rebecca: Really? I can understand why eating something that is not really food would make you sick, but how can just smelling or touching something make you sick?

Rocky: Well, the doctor told me that some types of chemicals are so strong, that getting them close enough to smell might burn my eyes and nose! The doctor also said that some things will burn your skin if you touch it!

Rebecca: Wow! Let's look around my house for dangerous things.

(Rebecca looks inside a cardboard box set upright like a cabinet—it has real products in it or magazine pictures of products that are hazardous.)

Rebecca: Rocky, how can we tell if something is dangerous?

Rocky: Let's look on the label for a picture of a skull and cross-bones. Another way to tell is to look for the words "caution," "warning," or "danger."

Rebecca: Look at this stuff! I'm going to throw it all in the garbage!

Rocky: NO, NO, NO! If you put it in the garbage it goes to the landfill and might leak into the soil or into the water deep in the ground that we drink from!

Rebecca: Oh, then I'll pour it down the sink!

Rocky: NO, NO, NO! If you pour it down the sink, it goes to the water treatment plant, but some chemicals are so strong, they might get into the rivers or lakes which would harm the fish, plants, and other wildlife!

Rebecca: Oh, I see, what if we pour it into the ocean where there's lots of water, then?

Rocky: NO, NO, NO! There are simply too many people and too many chemicals to be safe. Rebecca, DILUTION IS NOT THE SOLUTION TO POLLUTION!

(Rocky turns to the audience…)
Everyone say it with me, "DILUTION IS NOT THE SOLUTION TO POLLUTION."

Rebecca: Okay, now I get it, but how am I supposed to deal with these dangerous things then?

Rocky: Well, now that they are already in our house, we should first use them as they were intended and follow the instructions so we don't use more than we need. Next, if we have used all of a product that we want and still have some left, we should ask some of our friends and neighbors if they might be able to use the rest.

Rebecca: Oh, good idea, Rocky! But what if I try this and I still have some dangerous stuff left?

Rocky: Well, then tell your parents to call the city or county to ask about special places that take hazardous things and have special ways to get rid of them. Some cities and counties have "Special Collection Events" where everyone in the community can bring in their poisonous or toxic products for proper disposal.

Rebecca: Cool! When my mom and dad come home, I'm going to ask them to be careful with hazardous things and tell them these things need special disposal in order to protect our water and our wildlife!

Rocky: That's a good idea, me too! And I'm never, ever going to play with household products or eat anything that I don't know for sure is food again.

The End

Sources: Action for a Cleaner Tomorrow, South Carolina Department of Health and Environmental Control, Revised 1998, (K-8 edition), Columbia SC. Contact 1-800-768-7348. Modified by the Oregon Department of Environmental Quality.

Follow-Up Questions:

1. Is everything you might find at your home safe for you to touch, eat or play with?
2. Name some of the ways to properly handle some potentially hazardous things? (Use it up, give to a friend, call the city or county to find out how to dispose of it properly).
3. If you aren't sure if something is hazardous what three words should you look for on the label? (Caution, Warning, Danger).
4. Name some things that your parents can do to keep hazardous things away from you. (Store in a safe place, keep cabinets locked, explain what things are used for and how they are dangerous, etc.)

Play: The Throwaway Three

CHARACTERS

- A Roman
- A Settler
- A Colonist
- A Scientist
- A Briton
- A Cave Dweller
- An Industrialist
- A Native American

PROPS

Skins (cave dweller)
Roman Helmet & Bag of Trash (roman)
Stack of Trash (Briton)
Pilgrim Hat (settler)
Coonskin Hat & Leather (colonist)
Engineer's Cap & 3 Sweaters (industrialist)
(One handmade; two machine-made)
Lab Coat (scientist)
Nylon stockings , Plastic Bags &
Containers (industrialist)
Permanent-pressed shirt (scientist)
Plastic Bag & TV Dinner (industrialist)
Broken small appliance (scientist)
Toy Car (industrialist)
Indian Headband (native american)
blanket and plastic soda bottle (industrialist)
Clear glass vase with flower (scientist)

Cave Dweller
This is the tale of the Throwaway Three,
Of Man and his Garbage throughout his-to-ry:

Now they're very nice people, like you and like me,
who all have a problem, as you will soon see-
What shall they do with their garbage and trash?

(Everyone Together)

Why, throw it! Or bury it! Or burn it to ash!

Cave Dweller - 50,000 BC
I am a cave dweller who lives on the ground. What do I do with old stuff all around?
Why, burn it, like meat; burn it up in the fire;
Or bury it like bones, in the muck and the mire.

All

Yes, throw it, or bury it, or burn it to ash!
That's how we always get rid of our trash!

Roman - 200 BC
I am a Roman who lives in the town.
Our laws won't allow me to just throw it down.
I have to drag it away for a mile
And then I can dump it, forget it, and smile!

Briton-1200 AD
I am a Briton, wary and quick;
Down on our street it can get pretty thick.
When housewives up there want to pitch out their goo.
They just leave it out there and yell: "Gardy-loo!"

(Any Actor)
Stands on chair and yells, "Gardy-loo!"

Briton
It will stay there and stay there until the next rain, or until our fair London should burn down again.

All

Oh, what do we do with our garbage and trash: We throw it, or bury it, or burn it to ash!

Settler- 1630
I am the settler. I came without much,
But everything else I must make with my hands. So I don't throw out much - I use all I can.
Cloth scraps become quilts; I reuse my bent nails
It will be long time 'fore the next trade ship sails.

Colonist - 1700
I am a colonist; now life's not so tough.
We have trade between cities that brings lots of stuff
And some things are made by our townfolk today,
I could buy a new harness, throw this old one away.

We have pigs and hogs running loose in our street,
If I toss it out there, they'll eat it up neat!

Or I might bury it right over there.
Or I might burn it; nobody would care.
You see; the New world is the same as the Old!
We trashmakers come from the time-honored mold.

All

What are we still doing with garbage and trash?
You guessed it! We throw it away, or bury it, or burn it to ash!

Industrialist- 1890
I'm the industrial person and new on the scene, I mass-produce goods with my trusty machine.

This sweater, handmade, took a week in days of yore,
But now in one hour, I can make forty-four.
I make things so cheaply, you can now afford two
And throw out twice as much trash as you need to do.

Scientist - 1950 (Scientist)
I am the scientific person in the new post-war age.
We've learned a few tricks while the war shortage raged.
When we couldn't get natural stuff to process
We invented synthetics to replace the rest.

Industrialist
Rayons and nylons, acrylics and plastics,
For furniture and clothing and even elastics;
Forget your old woolens and silks and your cotton;
Real wooden toys and washboards are forgotten.

Scientist
Our new stuff will last 'til forever, you see
Even when it's worn out to you and to me.
Permanent pressed, pre-sized and pre-shrunk.
When dingy and old, it's still permanent "junk."

(Any Actor)
Yells, "Junk!"

Industrialist
We make instant menus that come in a PACK. You just boil the food in its own plastic sack.

Or our TV dinner in its tinfoil tray
It's quick; you don't wash it; just throw it away!

Scientist
We make lots of TVs and clothes dryers, too.
Don't ask for a trade-in; you're kidding, aren't you?

Industrialist
Our new cars all change with each model year,
Don't try to repair them, the cost's much too dear.
Besides, we don't bother to make last year's parts
For Skylarks, or Novas, or Cougars, or Darts.

Scientist
It's the New Thing, the NEW that America craves.
So out, out with the old stuff, away to its graves.

Industrialist
So what if there're more of us buying more goods?
So what if they won't rot away as they should!

Native American
Now wait just a minute! You cannot fail
To include me in your historic trash tale.
We Indians lived simply, on prairies, in woods,
We made no high trash piles, nor mass-produced goods.

Let me be your critic, show where you stand;
And tell you just how you're defiling our land.
Your new fangled goods will not rot away.
When you throw them all down they remain where they lay.
Then you say you will bury them deep in the ground:
All your urban trash will make quite a mound!

So then you will burn it, in smoldering masses
And fill up our air with smoke, deadly gases!
Oh, all of your answers have faults everywhere;
You'll either ruin the water, the land or the air.

What's more, your resources--your lumber, your ore--
Get smaller each year than the year before.
And what's more--this old earth's not making any more.

Industrialist
You're right. Our resources are shrinking away
While our garbage problem grows bigger each day.
We're always converting resources to refuse
Instead of recycling them for reuse!

Scientist
Oh stop it! Don't drop it! We'll think of a way
To make food for cows that's much better than hay.
Don't burn it, return it--we'll make something new,

(*Flower in the bottle for a vase, flower out, bottle held up to the eye for a spyglass*).

A vase for your mother, a spyglass for you.
Don't bury it, carry it--back to the mill.
We'll make a new blanket to ward off the chill.

(*Wrap the blanket around shoulders*).

Industrialist
It's time we progress past the Disposal Age
And make recycling the popular rage!
We'll have to give up old solutions for trash
And all realize that its pure balderdash--to just...

All

Throw it, or bury it, or burn it to ash!

This glossary contains all the vocabulary words used in the lessons, as well as a few other terms used throughout the Rethinking Recycling materials.

acid: a chemical substance capable of reacting with and dissolving certain metals to form salts, turning litmus indicators red, of reacting with and bases or alkalis to form salts, or having a sour taste

activism: a method of accomplishing an objective through a concentrated action(s) by a group or an individual

advertising: making known or praising publicly, usually in order to sell something

aerobic: the state of having oxygen, for example, for healthy composting, aerobic conditions are necessary

alternative(s): the choice(s) between two or more things

aluminum: a type of metal produced from bauxite ore. It is used in making hard, lightweight, corrosion-resistant materials

anaerobic: the state of being without oxygen, for example, anaerobic conditions are not desirable in healthy composting processes and typically lead to foul odors

aquifer: a porous layer of underground rock that holds water (see also groundwater)

ash: the solid residue formed after something is burned or incinerated

ash monofill: a specially constructed landfill for burying the ash created when waste is incinerated

audit: a careful review of a collection of items or data for the purposes of analysis or conclusion, such as a waste audit of the trash generated by an individual or group

bacteria: the tiny microorganisms or "bugs" that are useful in composting because they break down organic matter. However, bacteria can also be unhealthy such as the kind that grow on garbage and litter

bill: a proposed law offered to a legislative group

bioaccumulation: process in which certain substances (like pesticides or heavy metals) move up the food chain. For example, they are ingested by aquatic organisms, which in turn are eaten by birds, mammals or humans, with the result that the substances become more and more concentrated in our bodies as they move up the chain

biodegradable: capable of being broken down into simple substances or basic elements by microorganisms

REDUCE
REUSE
RECYCLE

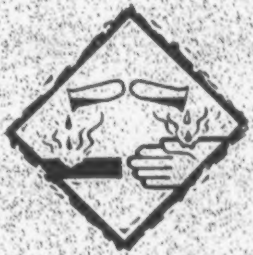
Bottle Bill: the Oregon law (the first in the U.S.) that requires a 5 cent deposit on certain types of drink packages such as glass and aluminum. The deposit is paid by the consumer and is refunded upon the return of the container. The bill acts as an incentive to keep containers from being littered or thrown away and instead recycled

buying in bulk: the act of purchasing a product in a large quantity, this usually implies that the product has less packaging and costs less per unit weight of the product when =compared with buying a "single-use" quantity

by-products: waste or leftover resources that are produced from the manufacture of products (not the intended product)

CFCs or chlorofluorocarbons: a type of chemical compound composed of carbon, chlorine and fluorine that is nonflammable, nontoxic and easily liquefied. Historically used in refrigeration, air conditioning, and aerosol propellants. Many countries, including the U.S. signed the 1987 Montreal Protocol calling for a 50% reduction in the use of CFCs by the year 2000 after scientists discovered that CFCs would rise to the upper atmosphere and contribute to the destruction of the ozone layer. (See also HCFCs and Ozone)

cardboard or corrugated cardboard: a very strong thick paper that is made into shipping containers and commonly contains recycled fibers. It can be distinguished by the corrugated (wavy) layer in the center (see also corrugated and grayboard)



caustic: capable of corroding, burning, dissolving, or eating away by chemical action

caution: a warning word on labels for moderately toxic substances (lethal dose: an ounce to a pint)

climate: the average course of condition of the weather based on temperature and precipitation over many years

climate change: the current scientific theory that too much carbon dioxide and other man-made gases are now occurring in large quantities in the atmosphere. The presence of these gases is believed to be causing a rising global temperature

closing the loop: a term for the third chasing arrow in the recycling symbol that reflects the act of a person "buying recycled" i.e., buying items with recycled-content

commingling: a recycling term describing the collection of materials such as newspaper, cardboard, plastic bottles and cans all in the same container

compost: v. to facilitate the decay or decomposition of organic matter (grass, leaves, food, etc.); n. humus-like organic product generated from the act of composting

consequences: the result or outcome that logically or naturally follows from an action or decision

conserve: to preserve and protect natural resources from loss or waste

consumable: a product designed to be used or eaten up, used or expended

consume: to waste, squander, or destroy totally; absorb or use up, as in a purchase

consumer: a person who acquires goods or services for his or her own use and not for resale or production of other goods or services; a buyer

consumer choice: the idea that a person affects how companies behave through their purchasing preferences, for example, by choosing a recycled product over a disposable one, more companies will manufacture recyclable products

consumerism: the theory that progressively greater consumption of goods is economically beneficial

container: a thing in which material is held or carried; receptacle

contamination: the process by which something is made impure; in recycling contamination occurs when people do not properly sort materials from one another

convenience: being suited or favorable to one's comfort, purpose, or needs; increases comfort or makes work less difficult

corrosive: a chemical agent that reacts with or attacks the surface of a material causing it to deteriorate or wear away. A corrosive has a pH level below 2 or above 12.5

corrugated: the shape in folds or parallel and alternating ridges or grooves, in this case the middle wavy layer of a cardboard box (see cardboard)

crush: to press or squeeze to force out of shape

culture: accepted traditional customs and usage of a given social group; moral attitudes; ways of behaving

cycle: a process where the various stages end up at the beginning step again and repeats itself over and over again

DEQ (Oregon Department of Environmental Quality): a state agency, created in 1969, that is responsible for protecting and enhancing Oregon's water and air quality, for cleaning up spills and releases of hazardous materials, and for managing the proper disposal of hazardous and solid wastes

danger: a warning word on labels for substances that are extremely toxic or hazardous (lethal dose is a drop to a teaspoon)

decay: to decompose or rot

decompose: to decay or rot; come apart; change form; break down into simpler components

deposit: the money paid by a consumer to a retailer for returnable beverage containers, refunded to consumer when the container is returned to the store

depot or recycling depot: a place where recyclable materials can be delivered and are collected for further processing

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dioxin: a general term that describes a group of hundreds of chemicals that are highly persistent in the environment. The most toxic compound is 2,3,7,8-tetrachlorodibenzo-p-dioxin or TCDD. The toxicity of other dioxins and chemicals like PCBs are measured in relation to TCDD. Dioxin is formed as an unintentional by-product of many industrial processes involving chlorine such as waste incineration, chemical and pesticide manufacturing and pulp and paper bleaching

disposable: designed to be thrown away after use, usually short term such as paper plates at a picnic

disposal: the act of discharging, depositing, injecting, dumping, incinerating, leaking or placing of any waste into or on any land, air or water

dump: n. a place where garbage is disposed openly on the ground or is buried in a hole, but has no construction or management for environmental or health protection like a sanitary landfill v. the act of disposing garbage or unwanted things, often has a negative meaning referring to "illegal dumping"

dumpster: a large metal container for collecting garbage, but may also be marked for the collection of recyclable materials

durable: an object that is made to last for a long time such as furniture, a car, or appliances and also generally describes high quality goods such as clothes or other personal items that will last if cared for properly

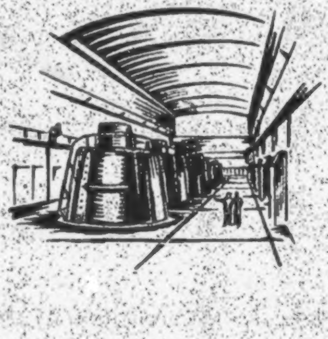
EPA (U.S. Environmental Protection Agency): a federal agency created in 1970 by President Nixon. Sets laws and regulations that protect natural habitat, wildlife and human health

Earth Day: a national day of celebration, started in 1970, where people engage in various environmental activities such as tree planting and stream restoration

ecology: the study of organisms and their relationships with the environment, often used as a synonym for the word "environment"

ecomanagement: using ecological criteria (relationships between organisms and their environment) to make decisions or choices when planning activities, processes, or purchases

ecosystem: a term used to describe the environment or a specific habitat. For example, the entire planet is an ecosystem of air, water and land, but a wetland ecosystem describes particular conditions that exist where certain types of plants, animals and water coexist in a specific balance



energy: the capacity to perform work (i.e., to cause change by pushing, pulling, heating, etc.) (see energy recovery)

energy intensive: requiring a great deal of energy

energy recovery: the production of energy from one form to another, such as the burning of garbage (incineration) to provide electrical energy for homes or businesses

environment/environmental: a term usually referring to the earth, animals, plants, air, land and water; the habitat or make up of the world in which we live

environmental impact: the effect a particular action or practice has on the environment or its components (land, air, or water)

environmental management: the act of consciously planning and making choices to preserve or protect the environment and/or its components

ethical: acting in accordance with the accepted principles of right and wrong that govern the conduct of a society or profession

finite resources: things of value, such as oil, with a fixed or limited amount or availability

flammable: a substance that is easily set on fire; capable of burning rapidly

food chain: the transfer of food energy from one organism or animal to another, such as grass being eaten by a cow and then humans eating the cow

garbage: anything considered worthless that is thrown away

generator: the source of production, in this case of waste or recyclable material

global impact: the effect a decision or action will have on the world or people worldwide

groundwater: water that is below the earth's surface and is at risk from being polluted by chemicals leaking into the ground from landfills and other sources

grayboard: a type of thick paper similar to cardboard that is made from newsprint and other recycled fibers and is commonly used for packaging, for example cereal boxes

HCFCs (hydrochlorofluorocarbons): The HCFCs include hydrogen atoms in addition to chlorine, fluorine, and carbon atoms. They are used as a substitute for CFCs, and although less destructive, they are still capable of ozone depletion

HDPE (high-density polyethylene): a plastic resin used to produce bottles like milk jugs or crates and products made from recycled HDPE such as plastic lumber or picnic tables

hierarchy: a group of people, ideas, objects, etc., arranged in a graded series (high to low, good to bad, etc.)

HFCs (hydrofluorocarbons): The HFCs are considered one of the best substitutes for reducing stratospheric ozone loss because of their short lifetime and lack of chlorine

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hazardous: a warning word for substances which cause special problems because they are poisonous, explosive, corrosive of metal or skin, harbor disease-causing microorganisms, are radioactive, or are dangerous for any other reason

household hazardous waste: any type of waste product that exhibits one or more characteristics of hazardous waste (ignitability, corrosivity, reactivity, or toxicity) and describes items that should not be disposed of in a conventional trash can because of dangers to garbage collection workers and to the environment

human-made: items that are not naturally occurring; produced by human manufacturing processes

ignitable: a category of hazardous substances that catch fire readily (at temperatures less than 140 degrees) or explode easily (see also flammable)

humus: the rich organic earthy substance resembling soil that results from the process of composting

incinerate/incineration/incinerator: to reduce the volume of solid wastes by use of an enclosed device with controlled flame combustion; the furnace, boiler, kiln, etc., where wastes are burned under controlled conditions

industrial: of or pertaining to the commercial production of goods or services

ingredient: an element in a mixture or compound

inorganic: not composed of organic matter, especially mineral; any substance that is neither animal nor vegetable

integrated waste management: an approach to managing waste that includes all methods including reducing waste at the source, reusing materials, recycling and remanufacturing products, recovering energy from incineration of wastes and disposing of any remaining waste, usually in a prioritized hierarchy as listed above

irritant: a warning word for a substance that causes soreness, burning or inflammation

LDPE (low-density polyethylene): a plastic resin used to make plastic film (wrap), diaper liners, grocery bags and some squeeze bottles. Today, this type of plastic is recycled in very small quantities

landfill: a disposal facility at which solid waste is placed on or in the land, usually in a controlled manner (see also sanitary landfill)

leachate: liquid that has percolated through solid waste and/or been generated by decomposition of solid waste - contains dissolved, extracted, or suspended materials that are usually toxic. May contaminate groundwater and is especially a problem in areas of high rainfall and porous, sandy-gravelly soil

lifecycle: the full lifetime of a resource or product--from its initial mining or manufacturing, through its usable life and the salvage or recycling for remanufacturing or as a new product, or until disposal

liner: a thick protective layer made of industrial strength plastic that is placed in landfills to keep leachate away from groundwater

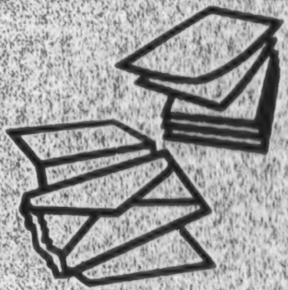
litter: waste materials carelessly discarded in an inappropriate place

luxury: something that is not essential but is conducive to pleasure and/or comfort

manufacture: to make products, especially on a large scale and using automated processes

material recovery facility (MRF): a facility designed to remove usable products or resources from the waste stream where garbage is often taken before it goes to the landfill

materialism: the theory or belief that physical well-being and worldly possessions constitute the greatest good and highest value in life; a great or excessive regard for worldly concerns



methane or CH4: a chemical by product created when organic materials are broken down under anaerobic conditions such as in a landfill. Methane is very flammable and ignitable and can create dangerous fires or explosions in landfills that are not properly managed

mixed paper: an industry term that refers to all recyclable paper that is collected in a recycling program except for newspapers, for example, mail, office paper, envelopes, etc.

natural resources: a material source of wealth occurring in nature such as timber, fresh water, wildlife or a mineral deposit

necessity/need: an item, feeling or belief that is absolutely essential to achieve a certain result or effect, in this case, to sustain life

NIMBY: an acronym for "not in my backyard"; an attitude taken by citizens who want a particular service or function to take place, but not in the immediate vicinity in which they live and/or work, such as the siting of a new landfill, for example

non-durable: an object that is not made to last, either it has a onetime use such as a disposable camera or it is poorly made and does not have a long life (see also durable)

non-point source: a term describing air, water, or soil pollution that stems from multiple sources such as streets, lawns, agricultural practices, etc. particularly from water runoff created by rain or street and driveway rinsing or washing. This type of pollution is not regulated because of the difficulty identifying any particular source

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non-toxic: a labeling term for "not poisonous or dangerous to life"

nonrenewable: natural materials, which, for one reason or another (scarcity, length of time required for formation, rapid depletion rate, etc.) are considered to be finite and exhaustible (see also finite resources)

opinion survey: a formalized collection of responses regarding individual attitudes, feelings or beliefs about a topic

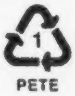
organic material: living or once living substances such as food, leaves, grass, etc.; scientifically refers to matter that contains carbon, hydrogen and oxygen

organic food: food that has been certifiably grown without the use of pesticides and fertilizers

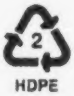
organic waste: garbage that is comprised of natural materials such as yard debris or food scraps

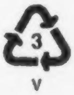
organisms: living individuals, plants, and animals

PET (polyethylene terephthalate): a plastic resin used to manufacture products like soda bottles and other transparent containers and is the most commonly recycled plastic besides HDPE (milk jugs). The recycled products made from PET include: T-shirts, carpet and fleece coats

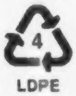


PP (polypropylene): a light, highly heat resistant and strong plastic resin used in packaging, coating, pipes, car bumpers and battery casing. It is difficult to recycle because it is mostly used in commercial products which makes it more challenging to collect in any significant quantity

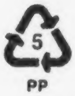




PS (polystyrene): a plastic resin often referred to as Styrafoam (a trademark name of Du Pont) that is used in coffee cups, egg cartons, and almost all packaging pellets. There are negative environmental impacts associated with PS because of the ozone depleting by-products made in its production. Recycling PS has been unsuccessful because of high shipping costs. Shipping companies have begun reusing the packing materials to keep them out of the waste stream. There is a biodegradable packaging material made from a corn base that is becoming more common

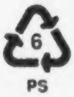


PVC (vinyl/polyvinyl chloride): a plastic resin commonly used to produce pipe, packaging and some toys. The by-product's of producing PVC are known carcinogens and are very dangerous when released into the environment



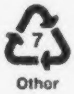
packaging: the wrappings, container or sealing of a commodity

paint: a liquid mixture used as a decorative or protective coating that may contain hazardous substances



personal commitment: individual decisions or choices that are strongly supported by actions or behaviors

pesticide: any substance used to kill nuisance organisms



plastic: a substance made of various organic compounds that are derived from petroleum or natural gas and produced by polymerization (the binding process). The plastic manufacturers developed a numbering system for containers from 1-7 to identify one type from another. The various types are PET, HDPE, vinyl, LDPE, PP, PS and Other, respectively. Each number represents a type of plastic with differing physical and chemical properties

which currently makes recycling plastics very difficult and economically unfeasible

poison: a substance that causes illness, injury or death, particularly by chemical means

point source: a term to describe air, water or soil pollution occurring from a particular source such as wastewater from a factory that is released in a river or stream. This type of pollution is usually regulated by the city, county, state and or federal government

post-consumer content: refers to paper that is recycled back into a new paper product such as stationary or cardboard packaging (see grayboard). The percentage that a product contains is usually reflected on the label

pre-consumer content: refers to scrap paper that is generated during the manufacturing process and is recycled back into the manufacturing process rather than being treated as waste. The percentage that a product contains is usually reflected on the label

precycle/precycling: the act of making choices prior to purchase to reduce the amount of waste generated from the purchase—includes buying in bulk, buying recyclable packaging, using reusable bags, buying products with little or no packaging, etc.

private: a business or enterprise not regulated by state ownership or control

problem: a question or situation that presents difficulty, uncertainty, or perplexity

product: something produced by human or mechanical effort or a natural process

pulp: a mixture of fibrous material such as wood, rags and paper that is ground up and moistened to be used in the paper making process

quality: the degree or grade of excellence of something

quantity: an amount or number

raw materials: resources in their naturally occurring, unrefined or unprocessed state

reactive: a warning word for a substance that undergoes an unwanted reaction when exposed to other substances such as air or water

rebates: a deduction from the amount to be paid or a return of part of an amount given in payment

recyclable: a product made of materials that can be reused as material for the same product or for new products

recycle: the collection and reprocessing of manufactured materials for reuse either in the same form or as part of a different product

recycled-content: a term that refers to a product made from materials

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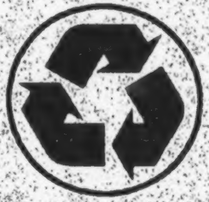
that were collected for recycling, rather than from virgin materials from nature

recycling loop: the symbol of three chasing arrows; the first represents collection and processing, the second represents the manufacture of recycled-content products and the third represents the purchase of recycled-content products



reduce: to lessen the amount, degree, extent, number or price, in this case, amount of waste

regulatory agency: a government agency with the assignment to enforce regulations passed by legislative process

renewable resource: a natural resource, which can be renewed or regenerated by natural ecological cycles or sound management, practices, such as trees and water (see also nonrenewable resource)

resource recovery: a term used to describe the recapturing of materials from the waste stream either by recycling, composting, or waste-to-energy facilities

resources: a supply of something that has value and can be used or drawn on

responsibility: a duty, obligation, or burden

responsible: to be legally or ethically accountable for the care or welfare of something

returnable: a beverage container on which a deposit is paid at the time of purchase for which the deposit is refunded when the container is taken back to the point of purchase

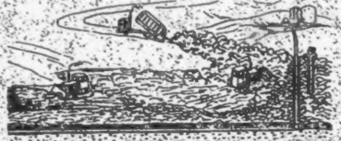
reuse: to extend the life of an item by repairing or modifying it or by creating new uses for it, generally in its original form

risk: the possibility of suffering harm or loss; danger

role-play: to play the part of; act out

sanitary: clean, safe; of or pertaining to health

sanitary landfill: a site designated for the burial of wastes in which the waste is spread out, compacted and covered with a layer of dirt. The site is constructed to reduce hazards to public health and safety, and under federal law must include an impermeable lower liner to block the movement of leachate into ground water, a leachate collection system, gravel layers to control methane, and other features



simulation: the act or process of imitating or acting like something, in this case acting out a planning and decision-making process using a credible scenario

soil texture or soil type: characteristic of the ground that determines various properties (sandy, clay, etc.)

solution: the method or process of solving a problem

source reduction: the process of reducing the amount of waste generated before it is created (see also waste prevention)

source separation: the sorting of recyclable materials into specific types (such as paper, aluminum, steel, and glass) before collection for recycling; opposite of commingling

stewardship: the responsibility for management and use of a resource or place

subsidy: the monetary assistance granted by government to a person or private enterprise

survey: to examine or look at in a comprehensive way

sustainable: referring to a process that can continue indefinitely without becoming depleted, for example, the harvesting of trees for paper, then replanting enough trees to sustain future harvests, as well as recycling existing paper in order to sustain the natural habitat of the forests

swap: to trade one thing for another

symbol: something that represents something else by association, resemblance or convention

tipping fee: the amount a solid waste collector pays to the landfill for the right to place garbage in that facility, usually in dollars/ton

toxic: a warning word for hazardous materials that are poisonous, harmful, destructive or deadly

toxicity: the degree to which a substance is toxic

transfer station: a holding facility for garbage where waste is reloaded into large trucks for more cost-efficient transportation to landfills, recycling dealers, and resource recovery sites

trash: worthless or discarded material; synonym: refuse, garbage, rubbish, waste

unregulated: an activity or entity that is not governed by legislative requirements

value: the principle, standard or quality considered worthwhile or desirable

vermicomposting or vermiculture: the process of using worms to break down organic waste material for use as a soil additive, which is, called vermicompost

virgin materials: materials that are taken from their natural state such as tree harvesting or mineral and oil extraction, as opposed to being remade from existing materials

volume: the capacity of a container; amount

warning: a type of label for a substance that is very toxic (lethal dose is a teaspoon to a tablespoon)

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waste: materials determined to be of no value and thrown away

waste hierarchy: the management plan for solid waste that treats waste prevention as the highest priority, then reuse, then recycling, then composting, then waste-to-energy recovery, and finally disposal as a last alternative

waste management: process of dealing with waste

waste prevention: the act of not creating waste in the first place; for example, repairing something rather than buying a new one, doing without something you don't really need, using e-mail instead of paper, etc. (see also source reduction)

waste reduction: reducing the amount of waste produced by careful buying, less wasteful practices, or reuse of materials

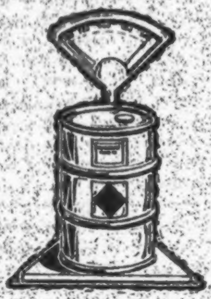
waste stream: all materials being thrown away, including items which could be recycled or burned for energy recovery

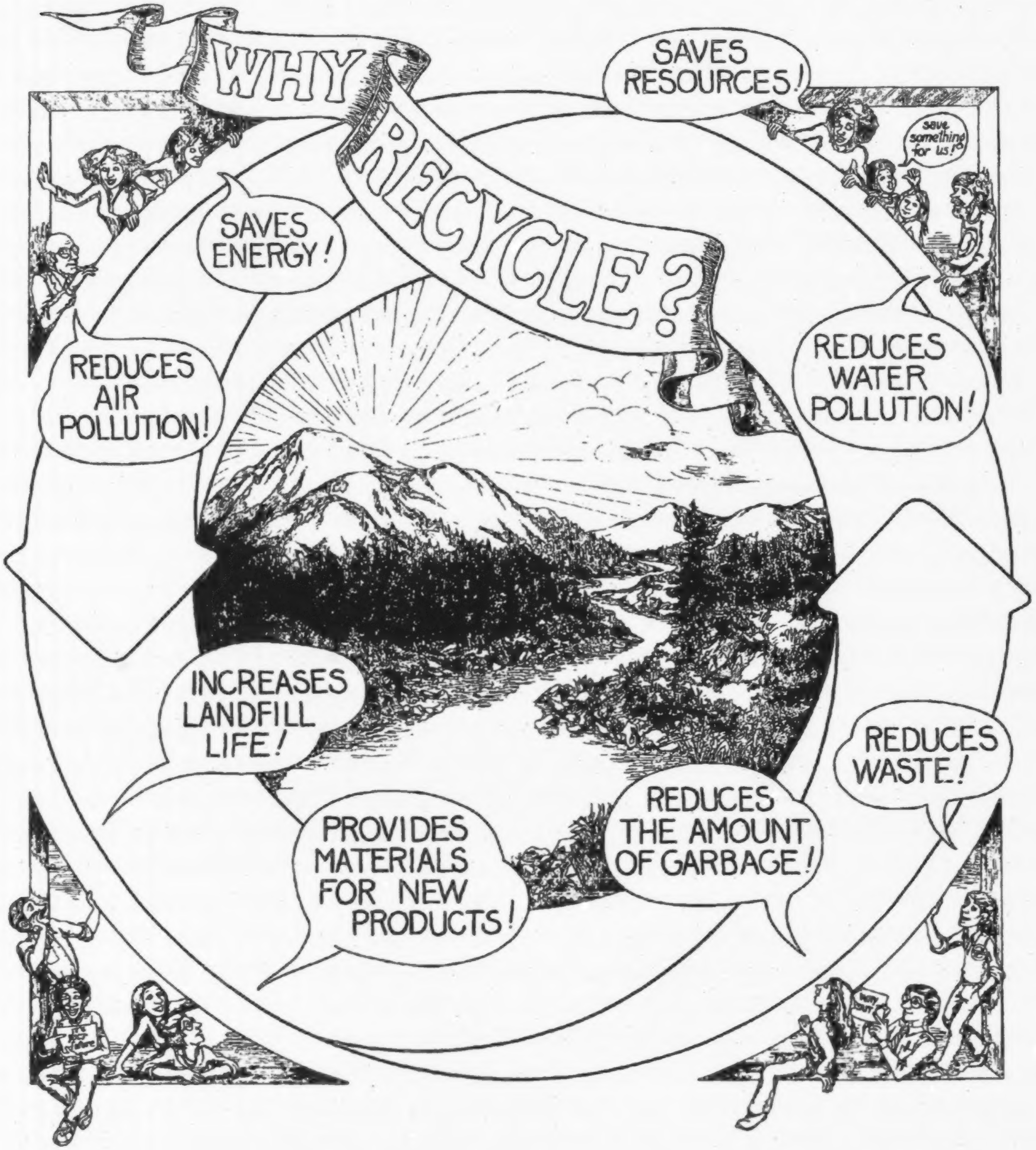
waste stream composition: components of the waste stream by kind of material (paper, plastic, wood, food, etc.)

waste-to-energy: the process of burning waste and harvesting the energy from the burning process for power

weight: a measure of heaviness or mass of an object

yard waste: any organic material from a home or business, for example, grass clippings, shrub prunings, etc.

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save something for us!
SAVES ENERGY!
REDUCES AIR POLLUTION!
REDUCES WATER POLLUTION!
INCREASES LANDFILL LIFE!
REDUCES WASTE!
PROVIDES MATERIALS FOR NEW PRODUCTS!
REDUCES THE AMOUNT OF GARBAGE!

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